REMOTE IMAGING GROUP

NEWSLETTER NO.28 **MARCH 1992**

REMOTE IMAGING GROUP.....OFFICERS 1991

NEWSLETTER EDITOR	James Brown 21 Windsor Rd, Porthcawl, Mid Glamorgan, CF36 3LR Tel: 0656 782632
MAKE-UP EDITOR	Mike Goodall, G0MGI 2 Meadow Court, Littleport, Ely, Cambs. CB6 1JW Tel: 0353 860646
CHAIRMAN	Henry Neale, G3REH Thornlea, Fishergate, Sutton St.James, Spalding, Lincs. PE12 0EZ Tel: 0945 85353
RIG BBS	Tel: 0945 85666 (14,400Bd & down inc.V32,V22)
MEMBERSHIP SECRETARY	All membership enquiries Ray Godden, G4GCE Wayfield Cottage, The Clump, Chorleywood, Herts. WD3 4BG Tel: 0923 720714
TREASURER	Mark Clarke, G3CQL 9 Park Lane, Bulmer Tye, Sudbury, Suffolk, CO10 7EQ
RUSSIAN SATELLITE INFO.COORDINATION	Les Currington, G8LOK 14 Homerfield, Welwyn Garden City, Herts. AL8 6QZ Tel: 0707 326058
GENERAL ENQUIRIES	John Tellick Tel: 081 390 3315
COMMITTEE	Gordon Fleming, Colin Hall, Peter Newman, Ray Godden, Dave Cawley

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Front Cover Photograph: NOAA11 on 31st August 1991 at 15.35 GMT. Visible Image (part of a 800x600x256 frame) by Gordon Train. (Whole image available on GIF Library Disk No.12).

FROM THE EDITOR'S DESK

It appears that 1992 is on course to be one of the most interesting years weather-wise. Already of note, for the first time this century, an intense hurricane has raged around the Pacific this Winter, and whilst the Sahara has been bathed in showers, large parts of Australia are experiencing the worst drought for over 40 years. The effects of the Philippine volcanic eruption and the severe depletion of the ozone layer in northern latitudes have brought about unusual stratospheric turbulence. Couple this with the present peak in the sun-spot cycle, and the statistical evidence that the end of centuries have been accompanied by great climatic extremes, and you have a recipe for some interesting weather watching in the future!

It seems as if RIG has definitely gone international with this edition. Aussie 'neighbours' have invaded our magazine this quarter to share a tinnie or two with us, though I find myself wondering if we are really ready for another farmer with the gift of the gab! It's good to know also that RIG is received as far afield as South Africa, and from Switzerland help is on its way for blue LED junkies. It looks as if it's out with the atlas time again. One way or another it all contributes to a greater awareness of what is happening to the weather on a global scale, as well as increasing our general knowledge of the ironmongery put up to help us in observing the earth.

As we go to press we send good wishes and greetings to Les Currington who has had a spell in hospital. We've asked him while he's wired up to monitors etc., to see if he can get his hands on any redundant NHS frame-stores...., but in any case we wish him a speedy recovery.

We're always keen to take up member's suggestions where appropriate, and one or two items in this edition have been generated as a response to such feedback. Probably many like myself have looked at the increasing number of modem related items with a sense of wanting to join in the fun, whilst getting cold feet at the thought of trying to master what seems at times to be a black art. In the past the cost of modems has also been a disincentive, but with tumbling prices, perhaps the time has come to consider a long-term investment in this area. Thanks to Mike and son for putting another useful piece together. Since having the loan of the RIG modem I can vouch for the usefulness of these boxes, and with some practice I can now get in and out of a bulletin board, having downloaded full keplers, in less than three minutes! Hardly enhancing BT's profits! Now if only I could get in and out of a conversation with the chairman like that....

The centrefold takes a different form this issue. Instead of the state-of-the-art photographs, we're featuring two different and interesting approaches to the question of how to get hard copy. Perhaps our readers know of other ways.

After a plea for more contributions I'm afraid we have had to disappoint quite a few who submitted articles for publication. Our RIG printers, and postage bill can only cope with about 88 pages maximum, and we were fast reaching that at the start of February. We then had six substantial articles arrive the day before the deadline! The moral of the story is that if you want to be fairly sure of being included then get pen to paper well in advance of the deadline. However it is nice to have this kind of problem! Our thanks again to all this edition's contributors, the only reward I'm afraid is the fame of seeing your name in this priceless publication, and the undying thanks of a worldwide membership of RIGleys. What more could you ask?

Cheers for now, James Brown

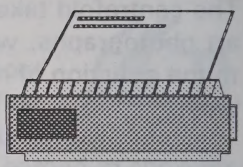
METEOSAT

MOP-2, now known as Meteosat-5, has been placed at 4 degrees West and is to be used as the in-orbit spare. The small image instability is still being investigated and Meteosat-4 is being used as the operational unit. Meteosat-3 is situated at 50 degrees West, and operates for Eumetsat, for the Atlantic Data Coverage Mission. The third and last satellite for the Meteosat Operation Programme, MOP-3 (MET-6?) is due to be launched in September 1993. The waiting time is being used to upgrade the ground support equipment and correction of the black-body calibration mechanism which showed indications of improper operation on MET-4. Analysis and metallurgical examinations indicated a sticking of the contacting surfaces, and a new set of surfaces are being tested and installed in MOP-3's radiometer.

NOAAS

Following NOAA-12's successful launch in May 1991, Earthnet's handling of the Tiros mission will be based on a morning acquisition from NOAA-12 and an afternoon acquisition from NOAA-11. Although officially NOAAs 9 and 10 have been retired, they still transmit useful pictures at the time of writing. They are of course switched off then their orbits coincide with NOAAs 11 and 12.

FROM THE MAKE-UP EDITOR'S KEYBOARD



Well we are catching up at last. If all has gone well you should have had this issue land on your doormat at the beginning of March and it should be plain sailing from then on (where have I heard those words before?). All future deadlines of the Newsletter will be simple to calculate; they are simply the 1st of the month preceeding the Cover Date of issue...

Cover date of Issue	*Deadline for Copy and Adverts*
JUNE 1992	1ST MAY 1992
SEPTEMBER 1992	1ST AUGUST 1992
DECEMBER 1992	1ST NOVEMBER 1992
MARCH 1993	1ST FEBRUARY 1993

These dates will be rigidly adhered to (it is the only way we can guarantee to get the Newsletter out on time) and there will be NO exceptions. Late copy will be included in the next available Newsletter, and late advertisers will have their previous adverts reprinted!

I hope you like the new cover style of the Newsletter; we hope to print a good new image on each issue. We are always in need of good pictures for the centre-fold as well (the age of the images is not so important, as long as the quality is good), so if you have any, please send them to James for evaluation. The Sun is getting higher in the sky now, so there may be some good visual NOAAs and Russian Mets.

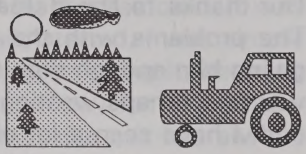
PLEASE REMEMBER... SEND ALL COPY FOR ARTICLES, READER'S LETTERS, ETC. TO JAMES BROWN. I only deal with the rig library and advertisers' copy on a direct basis.

INFO...

For those of you interested in the Meteorological aspect of our hobby, there is a company of long standing in Bedford who supply small quantities of Professional and Amateur weather forecasting equipment, such as Thermometers, Barometers, Rain Gauges, Hygrometers, Anemometers, etc. They do a range of Low Budget instruments for amateurs and schools, which may be of interest.

CASELLA LONDON LIMITED,
Regent House, Wolseley Road, Kempston, Bedford, MK42 7JY
Telephone 0234 841441 for latest catalogues.

CHAIRMAN'S WAFFLE...



I should be getting settled down now and everything should be organised to the extent that there is very little to do. "Should be!" are the operative words! Eventually we should get it all off to a fine art! How long it's going to take is nobody's business. We seem to go from one rush to another, but some things are going a lot better. Newsletters are nearly coming out on their cover date, and this one should be with you well before the AGM at Sandown. In fact James and Mike are doing a grand job and Mike is going great guns in modernising our image. I hope you like the new style. It's all Mike's own work. We needed bringing into the 1990's but as usual we are a bit late! We all have high ideals to aim for, but sometimes reality is far from what is intended. Less of that, and lets get on with recent developments.

The Electronic Bulletin Board has been running for a couple of weeks now. When the last Newsletter was posted it was still at Cambridge in the care of David Juett. He hadn't completely debugged it, so I put an answerphone on the line with a recorded message saying that it would be on shortly. So many of you tried that number that I got 30 or more calls, to see if it was on. It was obvious that you were not listening to the message on the loop of tape and that I should do something about it. Why? Well you were dialling? - ringing in with machines, and the only thing that talks to a machine is another machine. So I had a quick word with David and decided that bugs or otherwise, I had to get the machine on-line A.S.A.P. On the evening of the 20th of January I went and collected it. It was connected up the next night, but the Cambridge Exchange use tone dialling; out in the mud flats of South Holland (Lincolnshire) you have to rub two bits of metal together to do the same thing! It was changed over to pulse dialling and then put on line at about 23.30 pm. By midnight it had received two calls and the second was its first international one from Fred from Belgium. On the first full day it was on-line it was accessed over 20 times, and Jo from Holland called. We have now had Esko from Finland to add to the roll call of the BBS.

It often doesn't work properly but it is still being persevered with. I should be giving you a run down on how to use it now, but it is still on trial. When it is more established I will give you a beginner's guide or something similar. At present we are just learning how to drive it, and we will improve / smarten up as we get more experienced -- as the Politician said! Sometimes the modem will not answer the incoming call; another time it locks up.

Our thanks to David Juett for his considerable effort in getting us set up. The problems with the EBB were not David's fault, more a case of not giving him enough time to fully debug it before using it! I will apologise to you for perhaps wasting your money on BT, but we will get it right in the end! I have seen a lot of comments about poor line quality but you must remember that the height of the tide does affect the amount of salt in BT's system! The lines between here, the local exchange and the main exchange are very good, so it isn't the immediate lines but the ones that are incoming to Wisbech. These are a bit beyond Henry's control, but I can tell you that BT was not interested in letting me tap directly into the Fibre Optic cable that runs through my lawn!... I tried! One day soon all these problems might be just a memory of the past, with us saying "The Company" was getting money for old rope... in more ways than one!

Now for other things. My shortage of stock over the Christmas period has now been overcome, and I think that I can supply most items on a Return of Post basis. It was all beyond my control, but I will try and ensure it doesn't happen again. These last few months have resulted in a very high turnover and the added problems of VAT registration. Mark will tell you more about this in a separate article. Money and stock have changed hands so quickly that it has been difficult at times to keep up with it all. Even though I don't think there are any, there might be some correspondence that may have gone astray. If you were expecting a reply from me and haven't had one then please ring or write again. I think I am up to date within a little, but there have been times when I have wondered just who I was working for? I seem to spend more time working for RIG than on the Farm! Last year I travelled over 5000 miles for RIG, so please bear that in mind when things are not quite spot-on.

Christmas came and went, and I had big ideas of tidying this dump up! But with all the good intentions; I'm afraid it just didn't happen. I did get some tidying done but its surprising how quickly things seem to revert back to their former innocuous state. That word gave me some trouble - I couldn't find the spelling cheque! Mike is using a different word processor package now, and I am not very proficient at using it. I believe that even the last Chairman's Waffle was produced on it. But old habits die hard; and any word processing that I have to do internally, has to be done on the old system. I am having to change, but I still need to equate the old commands with the new ones; and they are never quite the same! When I am a little bit more at home using the new system, then perhaps I will change over to the new package permanently. It must be an improvement if Mike, James and myself can now all use the same system.

Henry objected to having to pay £12 for the use of his Access card. It was returned in 2 pieces. When the system was originally started, I was almost begged to use it. It did take some while to actually start using it, because I was always one of the "don't buy it unless you can pay for it" brigade. However over the years, and living out on these mud flats, it has always been difficult to keep bits and pieces in stock. I have quite a fair amount in stock (ask the Wife) and prided myself in having almost everything needed available. In more recent years I haven't always been able to keep things in stock (not at the rate I used to get through GASFETs) and began ringing up the suppliers and quoting the plastic. It turned up the very next day and Henry was happy. It then became used quite often. The amount at the end of the month was paid, and you start off with a clean sheet for the next month. Yes, I was late paying an odd time or two, but I never had the authorities after me. Then they changed the goal posts. For this service pay £12. Not yer Henry! So there was Henry without his access card. I applied for a Visa card, filled all the forms in, and waited. I was refused! If I'm not good credit risk, God help the Banks. No, they help themselves, to your cash; advising you that they've already taken it, just because you were 2p overdrawn! Back to the plot, I had filled in all the answers and in my mind I could not see anything detrimental at all. I bet they have some much dodgier clients than Henry! Yes, they have a right not to deal with someone if they don't wish to. There must have been a mistake. The family owns 100 acres of land and I cannot get a credit card! I wrote to them again and asked if they would check again just in case an error had been made. This time they informed me that they had used the services of a credit reference agency and did not find anything detrimental! If I sent them Tax assessments etc. they would review the application. I will point out that I do not Bank with this establishment. Eventually I was informed that I would be getting that little bit of plastic after all, and I cannot now say that the **** Bank didn't find Henry credit worthy. It just goes to show that you mustn't take no for an answer every time!

About 10 days after the last Newsletter was despatched, I was inundated with mail. Even Henry cannot keep up with 15 letters a day! I am up to date now but it takes some doing! I hope that this year won't be quite so hectic. In a few days time I shall be 50, as you've already been prematurely advised, and I should be taking it just that little bit easier. By the time you read this I will be over the hill, so I shall need every bit of help that I can get! So when you see Henry wilting at the back of the stand and showing signs of his age, don't walk on, give him a few minutes help. You never know who is also a RIG member; and we do have some colourful characters among the ranks don't we?

Over the last few weeks further developments have taken place on the LNA front. The in-flavour appears to be Pseudomorphic Inverted High Electron Mobility Transistors. They don't perform much better and I haven't heard a price yet. We are still supplying the same one until stocks run out and then I shall have to look at the situation again. A long but interesting article appeared in VHF Comms 4/1975 about noise in receive systems. It is a long article and you need to be well into that sort of thing to understand it. It does however show that the "ideal amplifier" with a 0 db noise figure doesn't exist, but if it did, you would still get noise! On wideband systems like HRPT or PDU systems (megahertz wide) you have to obtain signals that have a distinct level. The important consideration is that to go from a theoretical 0 db to an easily attainable 1 db means that you need a very small increase in signal level! This small difference is similar to 0.7 microvolts to 0.75 microvolts. In fact you will probably be using dishes for this and the increase in size would amount to say a 10% increase in area. This only amounts to an increase of 1.2 metre to 1.25 metre! All this struggling for low noise is not as profitable as at first appears! It does help when the signal is marginal, but you should not have designed it like that in the first place! No doubt you will hear more on this in the future.

Well that about wraps it up for another issue. We have learnt of Les Currington's health causing some concern. His oscillator needs monitoring and giving a kick now and again. He's looking for a circuit to make certain the volts don't get turned up accidentally! He doesn't want to do 4 lines a second when he's set for 2! I've since heard that he is getting on well and will soon be home. Everybody wishes you a speedy recovery Les.

While I've been typing this evening there have been 3 people looking around the Bulletin Board successfully, so it doesn't always fall down! More news on that and many more things in the next Newsletter. Hope to see you at the AGM on Saturday, 14th March, at Sandown (usual arrangements).

Best Wishes, Henry

FOR SALE...

Rodime 40 meg MFM drive £75 **Trident 512k SVGA card** £35 **Various PC cards ser/par ports, Floppy & Hard Driver cards.** Reason for sale - upgrade.

Also brand new unopened AMIGA s/ware. S/Wales Area Contact RIG editor.

FROM THE TREASURER

On the 25th November 1991 RIG became registered for VAT because our Sales income exceeded the threshold of £35,000 set by Customs and Excise

In 1990 the groups Sales totalled £18,607.42
In 1991 the groups Sales totalled £42,962.82

The principle reasons for this dramatic increase were:-

1. Previous to 1991 the group sold Dartcom Receivers and Downconvertors. RIG members paid Dartcom direct, therefore these sales were not included in our accounts. RIG received a commission from Dartcom. It was felt by the committee that this system had become very confusing to members and impossible to control. In 1992 RIG decided to purchase direct from Dartcom and sell to its members. This generated £6,980.54 in additional turnover.

2. Two new products were introduced in 1991:
PcSatIII sold £14,820.00 ProSatII sold £ 3,036.35

3. Membership increased yielding an additional £2,955.00 on 1990.

Our financial year ended 31st December and our accounts are now being audited and will be available at the AGM in March and published in RIG 29. The Group has in most cases absorbed the cost of VAT because it is able to reclaim the VAT on purchases, however we have had to increase the membership subscription by 12.5% to £9.00 to UK members only.

Finally, some of our members are themselves registered for VAT. If you purchased any equipment from RIG since the 25th November please write to me enclosing a SAE, together with details of the purchase, whereupon I will be pleased to issue you with a VAT receipt. *Mark Clarke, Treasurer.*

Your Dishes Delivered
RIG currently offers dishes for collection from principally the Chairman and at Rallies. Realising this may be inconvenient to some members, and impossible for those who live in those way out places, I have put together a Mail Order package for RIG dishes delivered to any UK destination.

a. One RIG 90cm Dish, complete with feed horn and mount, plus dish mount to a 2" pole. Price £80.00 inclusive of packing, but plus delivery at cost.

b. One RIG 100cm Dish, complete with feed horn and mount, plus dish mount to a 2" pole. Price £85.00 inclusive of packing, but plus delivery at cost.
All prices include VAT.

Delivery will be by the courier INTERLINK from whom I have negotiated special delivery rates. To find out the delivery cost please telephone in the evenings only, between 7.00 and 9.00pm please, or fax, or write enclosing a SAE for a quotation.

Mark Clarke, 9 Park Lane, Bulmer Tye, Sudbury, Suffolk, CO10 7EQ
Telephone: 0787 74128 Fax: 0787 475029

AN EX-MEMBERSHIP SECRETARY WRITES...

Des Watson

Having now stepped down from the post of membership secretary, I thought that it would be appropriate to write a few words, mostly of thanks.

I remember very clearly meeting Henry seven years ago and we spoke about his plans for an organization which was subsequently called the Remote Imaging Group. I don't remember quite so clearly the typing and software effort needed to produce the address labels for the pre-number 1 newsletter!

I confess that at the time, I never believed that RIG would ever grow to more than a few hundred members. But of course I was wrong, and over the years, the volume of post arriving here has been growing steadily. I've been lucky to have tolerant bank clerks and
postmen!

I've enjoyed the job enormously. Mixed in with the membership application and renewal forms have been many letters - often containing encouraging messages and interesting information - they have been a pleasure to receive. As a result of the job, I've made many new friends too.

As Henry mentioned in the last newsletter, it is really pressure of (real!) work which has made me resign. Some work abroad and the setting up of a new academic journal (nothing at all to do with remote imaging!) would have made it virtually impossible for me to continue as membership secretary. But I'm not proposing to give up my interests or work in remote imaging - so expect to see an occasional article in the newsletter.

I'd like to say thank you - to all the RIG membership and committee for making my time as the membership secretary so pleasant. And I'd like to convey special thanks to Henry and to Phil. Without their competence and enthusiasm, RIG would have collapsed long ago.

FOR SALE...

ATARI ST 1 Meg + £800.00 of software. £280.00 inc. P&P
Jason Turner, 23 Lalebrick Rd, Hooe, Plymstock, Plymouth, PL9 9RU

A PC-BASED WEATHER SATELLITE SYSTEM

Richard B. Emerson

This article describes an APT ground station using off-the-shelf hardware and "shareware" software for the PC family of personal computers. The two shareware programs are: TRAKSAT, an orbit predictor, and IMDISP, an image display and manipulation program.

Hardware Description

Presently I use a "Zapper II" crossed dipole antenna (described in Dr. Ralph Taggart's "Weather Satellite Handbook"), a Vanguard Lab WEPIX 2000-B receiver, the Schwittek (also called DRIG/Bartlett) MultiFAX MAP conversion board, and a 33 MHz '486 PC system. The PC has a 100 MB hard drive, 4 MB of RAM, and a SVGA display system operating under MS-DOS V5.0.

I built the antenna according to Dr. Taggart's plans. The antenna's performance is acceptable although I've been unable to remove some nulls in the reception pattern despite several attempts to adjust the antenna. This antenna was presented as a quick way to start receiving APT signals and in that capacity the antenna works as promised.

The Vanguard Lab WEPIX 2000-B is a ROM-controlled synthesized frequency receiver with two banks of eight frequencies each. As shipped by Vanguard Lab, the first bank covers the most commonly used APT frequencies while the second bank is centred on 137.500 MHz with each channel stepping up or down .005 MHz; this allows fine tuning output from an S band to 137.5 MHz downconverter. The WEPIX 2000-B's sensitivity and stability are very good. The only problem encountered in a year's service is a small amount of drift in the PLL circuitry. A quick session with a screwdriver applied to a trimmer corrected the drift.

The MultiFAX board only demodulates amplitude modulated signals (e.g., NOAA, Meteor, and Feng Yun APT and GOES WEFAX signals). In combination with MFMAP2, the driver software, it's capable of producing 256 level (i.e., 8 bit) grey scale images with 2400 samples per line (the board is capable of running at 4800 Hz, however). The input can be any reasonable input; I've used both direct output from the WEPIX 2000-B and an audio tape deck; both the board and the software have level adjustments.

I've tested the system described above with all four NOAA APT satellites and Meteor 3-5 fed to audio tape for delayed playback. I've also received

other Meteor satellites directly but computer generated RF noise precludes this operating mode. While I will eventually change to a quadrifilar antenna to eliminate the nulls in the antenna pattern, the rest of the ground station hardware is quite satisfactory for working with NOAA APT data.

Software Description

TRAKSAT

Unless standing by a receiver to await a satellite pass is possible, an orbit prediction program is essential for capturing a desired image. After reviewing a number of programs written in different computer languages, I've settled on TRAKSAT written by Paul Traufler.

Mr. Traufler is an "orbital mechanic" by vocation and avocation. The vocational aspect produced orbital predictions that are more accurate than most users will ever need. The avocational aspect produced a program that offers satellite track displays against star fields and in an orthographic view from space.

```
METEOSAT 3
1 19215U 88 51  A 92 14.82420063 -.00000258  00000-0  00000+0 0  3417
2 19215   0.1411 300.4727 0003617   1.9136  57.5788  1.00253620  1399
```

Sample 2-Line Element Set - Figure 1

TRAKSAT uses 2-line format element sets as shown in Figure 1. These element sets are sometimes called NORAD (North American Air Defense) or NASA element sets. The differences, in some cases, are based on the element source. There are minor changes in some fields but TRAKSAT can handle these differences. Conversion utilities are available for users familiar with or dependent on AMSAT element sets. Weather satellite users will frequently find that 2-line element sets are the preferred format for distributing elements.

As with other prediction programs, the ground station's location can be stored in a configuration file. In this program location (latitude and longitude) and station altitude are used to compute a satellite's predicted visibility. Visibility can be defined as being within the line of sight for radio reception, or directly observable for optical observation. In the latter mode, the sun's position is taken into account as well as the obvious questions of satellite elevation and azimuth. If satellite illumination is unfavourable, the satellite is marked as not visible although it's above the horizon. For example, a satellite which passes through the Earth's shadow while above the local horizon may be heard on a receiver but while not observable

optically. Users can modify the parameters which define the limits of visibility (e.g., the sun's height above or below the horizon).

TRAKSAT produces tables of position data according to the user's choices but it also has a powerful ground track display. In addition to showing a satellite's position, it displays the current sub-solar point and the location of the terminator. The tracked satellite's sensor coverage is also shown on the ground track display. The TRAKSAT ground track display includes data about the suborbital point's location, range and bearing from the ground station and related data, all with a high degree of accuracy.

Using the "delta time" mode, it's possible to look for the optimum satellite pass for a given location and lighting situation. Delta time parameters defines the starting date and time for TRAKSAT's functions. The name for this mode is taken from the final parameter, the time interval between iterations or the delta time value. Increments can range from several minutes to fractions of a second. TRAKSAT supports a user-defined list of up to 6 satellites which can be tracked in either real or delta time mode. For example, all NOAA satellites can be tracked simultaneously in delta time with an interval of 5 minutes until a desired pass occurs. Using the single satellite display, the pass can be analyzed in detail by selecting .25 minute (i.e., 15 second) intervals between prediction iterations. In all cases, the time interval applies to the orbital computations not the speed with which these computations are displayed.

Using the orthographic display, the same pass can be viewed from space. This mode uses a orthographic display of the Earth, viewed from a point in space, looking down at the ground station's location. The size of the globe varies with the satellite's average altitude. Using the orthographic display, it's very easy to visualize an orbit's inclination and precession.

For those interested in observing satellites directly, the same predictions can be applied to a display of common stars, the planets, and the moon. The resulting track can be printed on a variety of printers and then taken to the observing site to simplify spotting satellites. And, of course, it's possible to use TRAKSAT to figure out what satellite might have passed through a given constellation at a given time.

TRAKSAT has an analytical mode which produces tables of predicted rising times for a user-defined list of satellites. While the predictions in this mode are not as accurate as those given in the ground track, orthographic, and star field displays, they're off by no more than a minute or two. Using the

list of predictions from the analytical run as a guide, it's easy to produce refined predictions without guessing about possible rising times.

The analytical mode is essential for people who rely on taping satellite passes. The table has the predicted satellite rise, maximum altitude, approximate azimuth at satellite-rise and -set in cardinal points (e.g., north and southeast), and the duration of the pass. A pass with a maximum elevation of 10 degrees might be ignored in favour of a subsequent pass of 70 degrees. A pass from north to southeast will be useful for a ground station in Colchester to observe a system over the Alps. A timer, set according to the prediction data, can be used to capture the pass without wasting a great deal of tape.

The TRAKSAT user interface is essentially menu based but it uses a custom interface designed by Mr. Traufler. Specific menus (e.g., time) and options within a menu (e.g., real or delta) can be selected by pointing and clicking with a mouse or by typing the first letter of the menu or option's name.

All displays can be printed on Epson FX, IBM X-24, or Hewlett-Packard HP/GL compatible printers. All tables are output as ASCII files. While a math co-processor is certainly desirable, TRAKSAT will run on any PC or PC-AT compatible platform running MS-DOS V3.0 or later with at least 480KB of RAM available. The high resolution displays require a VGA display or better. The distribution kit includes the program, support files for star fields and station locations, a sample 2-line element set covering tens of satellites, and excellent documentation of the program and the concepts used in orbit prediction. TRAKSAT is distributed as shareware. Consult the documentation for current prices for registering personal editions and ordering commercial editions with additional features.

IMDISP

With the question of satellite orbit prediction resolved and the satellite's APT signal safely stored on audio tape, the next step is to demodulate the signal. The MultFAX board is an "open" design with at least three different drivers written for the board: APTCAP, XMAPRT, and MFMAP2 (supplied with the board). Currently MFMAP2 is the only program capable of capturing 256 shade grey images.

MFMAP2 has image display and printing capabilities but the display features are distinctly limited. MFMAP2 can store images in an unprocessed format (i.e., one byte per pixel) with 3.4 MB required to store a full screen resulting from a NOAA satellite pass. Meteor passes last somewhat longer than

NOAA passes and a screen-full is too small to capture the entire pass. MFMAP2 also takes twice as many samples per line as it should to maintain the correct aspect ratio for a Meteor pass; this problem can be corrected after the data is captured.

IMDISP displays binary and GIF image files and offers sophisticated image manipulation, too. IMDISP is able to create image segment binary and GIF files. (IMDISP's authors acknowledge that the GIF file handlers are prone to problems but a little experimentation will show easy ways around these problems. Later versions of IMDISP should have completely re-written GIF code.) COPIM, a utility shipped with IMDISP, is able to correct the aspect ratio of Meteor imagery produced by MFMAP2.

IMDISP's weakest point is its dependence on a command line interface. After starting IMDISP, all commands are entered by type-ins. For example, "display zoom 2" displays an image at twice normal size. On-line help is available for each command and its parameters. Through frequent use a set of commonly used commands become second nature and "disp cent left 50" comes off the keyboard without a thought. IMDISP supports batch files, allowing users to define new "commands" that perform a series of commands.

Any section of an image may be expanded by integer multipliers (e.g., zoom 2, zoom 3, zoom 4, etc.). Conversely, an image can be reduced by a similar manner (e.g., sub 2, sub 3, sub 4, etc.). It can be rotated through any angle in one degree increments. The 180 degree rotation for inverting ascending orbit images is treated as a special case making the rotation very quick compared to the other rotations.

Contrast stretching is done by defining the low and high values in DN's (data numbers) with black being 0 and white being 255. Typically "stretch lo 0 hi 120" will give good results for an early morning NOAA visible image. "Stretch lo 50 hi 255" gives good contrast on NOAA IR images. Subsequent image repositioning does not alter the contrast range.

In addition to linear grey scale images, IMDISP supports modified grey scale and pseudo-colour palettes. Twelve palettes are defined in IMDISP proper but several more are shipped as external files. IMDISP allows user-defined palettes. For example, Meteor images with their limited contrast range typically have problems showing ground detail. A custom palette has been created which enhances the black end of the image while keeping the white end of the image from losing all contrast. As an extra feature, IMDISP can

cycle an image through all the colours and intensities in the current palette. The "motion" of the colours in the image often enhances detail and structure.

While contrast stretching and predefined palettes are very useful, an image with noise or blurred features requires image enhancement. IMDISP supplies this capability, too. Speckles and streaks from noise can removed or "de-spiked" with a median filter. Lost detail can be recovered with an unsharp masking filter. Buffering allows the combination of an image processed with an edge filter and a median filter; the combination can be made proportional with an image added at a user-selected weighting. For example, an untreated image might be combined with an unsharp masked image at 50% intensity resulting in an image which retains some of the smoothness of the original image and the detail of the enhanced image.

IMDISP was initially written by Jet Propulsion Lab under contract to NASA in support of CD-ROM images from the Voyager, Magellan, and Viking spacecraft. Ron Baalke, Mike Martin, and Archie Warnock then continued to support IMDISP past V4.4 to its present level (V7.7 as this is written with V7.8 under development), accepting comments and incorporating recommendations from users as the program is distributed as "freeware" (i.e., there is no registration fee).

The current version of IMDISP handles several different VGA boards; support for additional boards is being added. For example, development of 24 bit colour support is under way. The authors are considering adding a SVGA graphical user interface, mapping projections, and further image processing features.

While IMDISP was written to support images stored on CD-ROM's, IMDISP is indispensable as a tool for inspecting weather satellite imagery. The rotate command allows ascending satellite images to be oriented correctly. The stretch command adjusts for image brightness and the enhance command brings out detail or removes visual noise.

Summary

The ground station described above may not be optimal, but it does meet the requirement for producing high quality APT imagery without a great deal of wasted effort. TRAKSAT gives reliable, accurate predictions of satellite passes. IMDISP allows full control over the contrast and detail of the received images. Now, if all of this came in one combined package along with a recovery tool for accidentally omitted passes...

Credits

Des Watson has been very kind to see that I receive back numbers of the RIG Newsletter. This article is an attempt to repay that kindness.

Paul Traufler was very helpful in preparing the section on TRAKSAT by supplying a pre-release manuscript of an article on TRAKSAT which will appear in SPEC-COM Magazine. Archie Warnock has kept me in beta versions of IMDISP and Ron Baalke very kindly sent me a pre-release manuscript of an article on IMDISP which will appear in CD-ROM Professional Magazine. Dave Schwittek of MultiFAX helped with input on MFMAP2, written by his father, Elmer Schwittek. Dr. Jeffrey Wallach and John E. Williams of DRIG helped by providing copies of demonstration programs and APTCAP and XMAPRT.

IBM PC and IBM PC-AT are registered trademarks of International Business Machines Corp. MS-DOS is a trademark of Microsoft, Inc. GIF is a trademark of CompuServe, Inc., an H & R Block Company. Epson FX is a trademark of Epson America, Inc. HP/GL is a trademark of Hewlett Packard Corp. Meteor is probably up for grabs - see B. Yeltsin for details.

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PROSATII INFO...

Users of the PCSAT3 system will know of the useful "ESC" key command that allows the Meteosat picture, just beginning, to be stopped when it reaches the end of the page, before it receives the next picture transmitted.

PROSATII users will note that this is not the case with the new program, as "ESC" will halt the picture when pressed. However all is not lost... If you press "Return" at any time during transmission of the picture, it will be saved as a "Temp0000.dat" file when it reaches the end, and continue with the next picture. This can be repeated until you run out of hard disk space, and the file names will be incremented by one each time, i.e. Temp0001.dat, Temp0002.dat, etc. These will appear on the Selection Menu when you request "Load Image", and the filename, can of course be changed via DOS, etc. at a later date.

FOR SALE...

Amiga A500 with Commodore Memory expansion, second drive and 9" colour monitor £150.00 (USA spec machine 110V with auto-transformer)

Atari ST1040 with second drive and 9" colour monitor £150.00

Archimedes A310 with 20Mb hard drive and Archimedes colour monitor £250.00

Apple II GS with second drive and 9" colour monitor £150.00, or £200 for two !

Apple IIe and disc drive £50.00

Trio TH77E 144/432 Mhz micro hand-held, base charger and spare battery, latest model, never used, 4 months old, £250.00

Nimbus PC186 with 1Mb, piconet card, Nimbus colour monitor £150.00 Or with Timestep weather satellite software £200.00

BBC Master and disc drive £100.00

ITT Chaeta Telex machine with built in printer, screen and word processor £50.00

Locata/Racal Navtext receiver/printer £150.00

AOR FAX printer, 12 months old, A4 paper roll, audio in and paper out, for HF and LF FAX £150.00

Sony AN P1200 Meteosat convertor and dish, 2 months old, cost £2000.00 ! sell for £800.00 ??

Sony ICF SW77 the latest microprocessor controlled huge LCD display, 50Hz steps. Ideal for HF FAX. Brand new £180.00

Offers for anything or swap for Test Gear or anything interesting.

Dave Cawley, Telephone: 0440 820040

MOUNTING CHIP COMPONENTS

Ian Cousins

Chip components are fundamentally different to leaded components, in mass and end terminations. The following is a method of soldering them to pcbs.

1) Use a hot, fine chisel bit - I use a Weller WTCP, with a PTA-8 or PTB-8 bit.

2) Use silver-loaded, soft solder, preferably 62% tin, 36% lead and 2% silver, commonly called Low Melting Point solder; approximately 0.7mm diameter (22swg) and flux cored. Trade references are Multicore Sn62 and RS Components 551-671. Most chip components are basically ceramic and silver is used to metallise the ceramic. The presence of silver in the solder alloy inhibits the absorption of silver from the component and subsequent loss of the metallisation.

3) Tin the component mounting area on the pcb.

4) Tin the component end by holding it with stamp collectors' tweezers or similar and bringing the component to the iron and solder - have a "pigtail" of solder sticking up from the reel.

5) Press the component in place with a resilient tool. A pencil with sharpened eraser end works, but the rubber stinks when it gets hot and leaves unsightly marks. Far better to put about 10-15mm of silicone rubber sleeving over the end of a test probe or small screwdriver, leaving 5-6mm unsupported. I use 1mm bore, 0.7mm wall thickness - RS Components' 399-394 is 1mm bore, 0.5mm WT. The silicone rubber acts as a cushion to absorb misdirected force, hand tremor and ill-suppressed excitement.

6) Tin the iron, then put it against the tinned component end and the tinned pcb, so as to cause the two to flow together. Add extra solder if it is necessary and if you're deft, but bear in mind that a small fillet of solder is the ideal for surface mounted components. A high build of solder only adds stress to the joint.

7) That secures one end. The other end can be done by the usual method of adding solder to the joint area, while applying heat from the iron.

This method of chip mounting is satisfactory for passive components, capacitors and resistors. For active components, it's prudent to take measures to avoid electrostatic charge damage, by wearing a wrist strap, working on an earthed, static-dissipative surface and using an earthed iron. For very light or particularly static-sensitive devices, the silicone rubber is best replaced by PTFE, which exhibits much less electrostatic attraction.

Ian Cousins is not a Highly Erudite Male Person, or HEMP, but a simple-witted peasant, living at Eudunda, a small town 110 km NE of Adelaide, South Australia, at 139°04E, 34°10S. His back fence is on the easternmost crest of the Mount Lofty Ranges and, from North-West through North to South-East, the view is almost unobstructed. By way of comeuppance, a noisy, leaky 11kV line passes his front door. The low orbiting weather satellite view covers the whole of Australia and extends from Timor and Papua New Guinea in the North to the Antarctic ice in the South and East to New Zealand and New Caledonia.

Having seen Sputnik I in his early teens and heard many others since, he has an unhealthy interest in satellites. His spouse, June, after helping set 2,500 "Pop" rivets for a tower project, once asked him "Why don't you have a proper hobby like Jeffrey over the road, sitting down and drinking beer?", to which question he still has no satisfactory answer.

He and June have a small electronics business, in which they make thick-film hybrid microcircuits. This involves printing and firing gold, platinum, palladium and silver materials on ceramic substrates.

WANTED...

Barograph, recording drum type, must be cheap, any age, condition, as long as repairable, and vaccuum chambers OK.

Any information on using **Sony UP-101UB** Videoprinter for Fax, WX, etc.

Mike Goodall, Newsletter Make-up Editor, Telephone: (0353) 860646

SOME HINTS IN USING THE SPACETECH FRAMESTORE SYSTEM ON THE ARCHIMEDES

Les Hamilton

Having been a user of Spacetech's excellent Weather Satellite Framestore Application for the Acorn Archimedes microcomputer for two years now, I have developed a few ideas that might be of interest to fellow RIG members. My activities have been restricted to observations from the various Polar Orbiting Weather Satellites, so what follows does not apply to Spacetech's Meteosat Animation package.

Since reviews of the software and hardware have already appeared in RIG, I will assume that readers are familiar on this front, and will therefore restrict what I have to say to a description of some modifications that I have introduced to optimise the potential of the system.

1. Structuring Image Discs

Entire satellite transmissions can be saved in the form of Framestore Images, where the transmitted data is stored in a form that allows subsequent manipulation of the image in a variety of ways. However, before an image can be saved to disc, the latter must be 'structured' using Spacetech's "*structure" command. This firstly formats the disc (whether it was previously formatted or not), verifies it, and finally creates the necessary directories to store the data. Unfortunately, this formatting and verification is time consuming, taking something like two minutes to complete. If, like me, you tend to have several blank formatted discs handy, you will no doubt find this structuring process a bit of a drag. Salvation is at hand however, in this short BASIC listing.

```
10REM> Dstructure
20*mount 0
30*cdir !Framestor
40*dir !Framestor
50*cdir setup
60*cdir palette
70*cdir image
80*cdir anno
90END
```

Once you have saved this program under the name "Dstructure", it takes just three seconds to structure a ready-formatted disc. It is, by the way, perfectly safe and feasible to exit from !Framestor, structure a disc in this

manner, and return to !Framestor, without affecting the image in the computer's memory. This is valuable when [as seems to happen all too often] I have decoded an image, and find I don't have a blank, structured disc available for saving it.

WARNING
Be careful when using this program. You must run it from either Drive 1 (if you have a twin drive machine) or otherwise from a RAM drive. I prefer the latter. Using the Task Manager, drag out a small RAM drive, then click on its icon to open its viewer. Now drag 'Dstructure' into RAM, and replace the disc with a blank, formatted one. Double-click on the 'Dstructure' icon in the RAM viewer, and your disc is structured immediately.

2. Maximising Saved Images
If you have a machine with 2 Mbyte or more memory, it is useful to customise the application to produce Framestore Images that completely fill one 800K disc. As supplied, the !Framestor application contains a !Run file which sets up parameters for the main program. As supplied, it reads thus:-

```
Wimpslot -min 320K -max 4000K
SetEval Frame Frame + 1
Set Framestor$Dir <Obey$Dir>
Run <Framestor$Dir>.!RunImage %*0
```

The first line of this file determines how much memory is assigned to the stored image. Without going into intricacies, altering these two numbers can result in the production of satellite images that are either

a) significantly smaller than the capacity of a disc, which usually leaves 200/300 Kbytes of disc space unused - insufficient for a second image, or

b) too large to fit completely on a single disc

Clearly, since E-format Archimedes discs hold a nominal 800 Kbytes of data, it would be ideal if the system automatically produced images that exactly matched this. This can most closely be reached by making both numbers on the first line of the !Run file 840K, as follows:-

```
Wimpslot -min 840K -max 840K
SetEval Frame Frame + 1
Set Framestor$Dir <Obey$Dir>
Run <Framestor$Dir>.!RunImage %*0
```

This alteration can be done easily and effectively by use of the !Edit application, which is supplied with every Archimedes microcomputer. It will be found that the resulting Framestore can hold up to 1559 image lines, which saves as a 780 Kbyte image file. This is the maximum feasible, as some disc space is also needed for the other directories created during the disc structuring process.

3. Customising Application Discs

The !Framestor application comes with a number of 'setup' files, each containing startup parameters suitable for a specific satellite. This default file is simply a renamed copy of one of the named setup files.

If, therefore, by way of example, you wish your system to initialise on startup to accept NOAA-IR images, proceed as follows:-

1) Delete the existing setup file named "default"
2) Load the NOAA-IR setup file
3) Save this setup file, but first change its name to "default". This name is vital, as the application specifically searches for a file of this name on startup. You can now label the disc "NOAA Infra-red Framestore". When starting up !Framestor from this disc, you will automatically be ready to decode NOAA-IR transmissions without further adjustment.

4. Saving Complete Images from Meteor Satellites

A problem I sometimes encounter, particularly with Meteor transmissions (which can last considerably more than 15 minutes), is that a full image stretching from North Africa to near the North Pole occupies considerably more than 800 Kbytes, and so will not fit on to a single disc.

The answer is to create a setup file that decodes only alternate lines from the transmission. Although this obviously halve the vertical resolution that can be obtained, it still produces excellent results.

Load a normal Meteor startup file and click on "Define sync" in the UTILITIES section of the !Framestor menu. Next move up to the item "PARAMETERS", and click on "Framing". The normal entries for decoding the full swath-width of a Meteor image are as follows:-

a) Pixels/line 1200
b) Pixels/grab 900
c) Pre trig delay 0
d) Post trig delay 80
e) lines to grab -1

N.B. The 'missing' 300 pixels from the transmitted signal represent the sync bars - they do not contain picture information.

To decode alternate image lines, increase "(d) Post trig delay" to 1280. This means that an additional delay of 1200 pixels (a full image line) is inserted after each line is processed, and before the next one is tackled.

Now exit, and save the modified setup file under the name "Compress". When using this file, you will observe that the screen image increments only with every second line of the transmission.

5. Producing a High Resolution Meteor Image

Spacetech supply various setup files for Meteor Satellites, with the following functions:

a) decoding the full image swath (see previous paragraph for details) in medium resolution

b) decoding the left-hand half of the image at maximum resolution

c) decoding the right-hand half of the image at maximum resolution

In order to minimise rf interference from the microcomputer, I always record satellite passes with the computer switched off. This has the bonus that I can later decode the transmission selectively.

On occasions, the main interest in a Meteor transmission is smack in the centre of the frame, and neither (b) or (c) of the above is satisfactory, as they crop the desired area. A setup file can easily be customised to allow this. Following the same procedure as in the previous section, adjust the "Framing" parameters as follows:-

a) Pixels/line 1200
b) Pixels/grab 512
c) Pre trig delay 0
d) Post trig delay 240
e) lines to grab -1

This setup file can now be saved as "MeteorCENT", and produces a maximum resolution image from the central portion of a Meteor transmission.

I hope that this note will provide some useful hints and tips for fellow users of the Spacetech Framestore. Have any other members developed ideas themselves ? If so, perhaps such items could be exchanged regularly through the pages of RIG.

WHICH MODEM?

Mike and Simon Goodall

Since the Timestep Bulletin Board, and now the RIG Bulletin Board, were brought into operation, we have had a lot of enquiries regarding the equipment required to use them.

There are two basic types of modem: *Internal* (a board which fits inside your computer) and *External* (a self contained unit that connects to the computer serial port). Both have a connector and lead that fit into your phone line socket. The type you chose will be dictated by your computer type. I don't know of any modern computer system which cannot have a modem added. PC based systems can use internal (the Modem PCB fits into one of the spare slots) or an external one plugged into the serial port. Other types of computers normally have a suitable Modem unit which can be plugged into the serial port.

The second consideration is the speed required. The old systems used baud rates (related to the speed that the data is sent over the phone line) of 75 bits per second. Some of the modern units can have rates of 14,400bps and over. The basic problem is cost. Generally speaking the faster the modem the more it costs. A 1200bps modem for a PC will cost you around £50 (cut price), whereas a 14,400bps modem could set you back some £450. A year or so ago the standard beginners modem was 1200. This year the entry level seems to be 2400. Several computer dealers have been offering the Amstrad MC2400 at around £100 recently. Beware of some USA models which have a lower output than on our BT system.

This decision on speed must be taken carefully. At 2400 it will take you around 18 to 20 mins to upload or download a 200Kb file. At 14,400 the same file would only take around 3 minutes to transfer. If you intend transferring large files (such as GIF images) then a fast modem must be your choice. If however, you only intend to download Kepler files (only a few Kb) then a slow modem (1200 or 2400) will be perfectly adequate. It will probably take you longer to Log on to the BBS. Most fast modems are downwardly compatible (meaning that they can work at lower speeds as well as their top speed). This is useful if you have a noisy phone line. Dropping down to a lower speed often cures the problem of erroneous characters appearing on the screen, or when downloading, the machine having to send data several times before it gets it correct. The first thing modem owners notice is a dramatic increase in their phone bills! Using it only at cheap rate times (6pm till 8am) can reduce them a little.

Computer owners of other machines such as Spectrums, Ataris, Amigas, Archimedes, etc. should obtain their monthly computer magazine and search the pages for the best deal. Software of some kind is normally supplied with the modem, suitable for your machine. But often these programs are not always very "user friendly".

The choice of software is quite wide. There are expensive commercial packages available costing literally hundreds of pounds, but the best bet is to go for shareware. These vary in "User Friendliness" considerably. The most popular for many years was Procomm, followed by Procomm+. The latest versions are being sold commercially rather than being offered as shareware. But there are some of the older versions still around. I would personally recommend this one for beginners. A ring to some of the Shareware advertisers in the Computer Mags will probably turn up a copy.

Due to the variations in the software packages it is impossible to actually tell you how to set up your modem to access the RIG or Timestep BBS's. You will have to read the DOC files and instruction manuals. But once you have set up and saved the Protocol settings you can probably access a BBS with a couple of key presses each time you need to connect. Uploading and Downloading files is as easy with very few keystrokes.

You will find when searching the pages of the Computer mags, that Bits Per Sec is not always quoted in adverts. The speeds are often quoted as V21, V23, etc. With the exception of V42 and V42bis (which refer to forms of error correction) the V number indicates the speed of transmit and receive, as follows:

Standard	Transmit	Receive
V21	300bps	300bps
V22	1,200bps	1,200bps
V22bis	2,400bps	2,400bps
V23	75bps	1,200bps
V32	9,600bps	9,600bps
V32bis	14,400bps	14,400bps

We hope that this article, intended as a beginners guide only, has been of help, and you will join the growing numbers of modem owners in RIG, who can now get weekly updated Keplers for the price of a phone call.

WXSAT MAIL LIST : NOAA SATELLITE NOTICES ON INTERNET

Richard B. Emerson

For those with Usenet or Internet access, NOAA weather satellite ("wxsat") bulletins are available via the "wxsat mail list." The notices placed on NOAA.SAT, the NOAA electronic bulletin board (EBB), are being re-sent via the wxsat mail list, an Internet mail list.

These notices include navigation summaries for GOES geostationary satellites, position predictions for GOES and polar satellites, and operational notices such as HRPT schedules and warnings about broadcast conflicts which will mean a satellite will temporarily be silenced. There are also occasional messages about Meteosat satellites and the Meteor and the Feng Yun series of satellites.

A mail list is the electronic equivalent of paper mail mailing lists. Messages are sent to all addresses on the address or subscriber list and, in the case of wxsat, messages from NOAA.SAT EBB are automatically collected and routed to the mail list. The term subscriber simply refers to individual addressees on the list; at this time there is no "membership" or subscription fee for entering a name on the list. It's up to the subscriber to carry the cost of operating an address, of course.

Wxsat is configured to relay messages between subscribers, too, something that NOAA.SAT doesn't do. Reports on ground stations, observations, and so on are sent out as they're received. Images, however, are not sent on this mail list; the traffic is strictly written text.

To subscribe to the mail list, send a message to "wxsat-request@ssg.com" with something like "sign me up" in it. If this address doesn't make much sense, you probably don't know how to access "the 'net" or don't have Internet access. Most colleges and many businesses have net access; check with your local computer experts to see if any of your sources for computer connections have Internet access.

If you don't have a local computer guru or Internet isn't in your guru's vocabulary, there are still alternatives available to you. A growing number of bulletin board systems (BBS) offer Internet access either for free or for a small fee. Check with local BBS operators for such a system. CompuServe has an Internet gateway although there is a limit on the size of messages for most users (anything under 50KB is allowed) and they may be a fee for receiving Internet mail. Fidonet has several Internet gateways but access

must be negotiated with the local sysop and the gateway sysop. (The volume of wxsat traffic can seriously affect systems that have to make expensive calls to collect net traffic.) There are also commercial systems that sell Usenet access. Wxsat uses one of these companies; unfortunately, writing from the USA makes it hard to suggest commercial sources outside of North America.

If you have net access but don't want to receive every bulletin, send a note to the wxsat administrator, Richard Emerson, at "wxsat-admin@ssg." Recent messages are stored in a temporary archive and they can be retrieved with e-mail messages. Information on retrieving these messages will be sent on request.

If all else fails, contact the administrator by mail at:

Richard B. Emerson
System Support Group
PO Box 180
Lansdale, PA 19446-0180 USA

NOTE: The distribution of NOAA weather satellite messages in no way indicates the endorsement of wxsat mail list by the US Government, the Department of Commerce, NOAA, NESDIS or any other Government or private entity. Wxsat mail list is operated strictly as a courtesy to its subscribers; all information is supplied strictly on an "as-is" basis.

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FOR SALE...

Martelec 1 Meg Framestore MSG20 for use with a BBC including the GRACE software. £185.00 ono.

Martelec Digisat interface card and software for IBM compatibles, including Laserjet printer dump. £75.00 ono.

Martelec MSR20 Satellite receiver, including 6 xtals for all the polar and geostationary satellites. £125.00 ono.

Angus M. Crawford, 26 Marlpit Rd, Sharpthorne, West Sussex, RH19 4PD

137 Mhz. RESONANT CAVITY

A.J.Whitehead

The Resonant Cavity shown in the attached sketch is not an optimum design, but it does filter out paging interference at the top end of the band.

Items required are as follows :-

Extruded aluminium box x 220 mm long (YN52G)
Double sided fibre glass P.C.B. 102 x 203 mm (FA58N)
10 mm diameter copper tube
14 S.W.G. Silver plated copper wire (Cirkit)
Square B.N.C. Chassis sockets (YW00A)
Misc. Brass bar, discs, 2 B.A. Brass studding & nut

(The numbers in brackets are from Maplin's catalogue)

The assembly of the cavity is shown in the sketch. The first three operations listed below are very important and require special care and accuracy because the gap between the tuning capacitor discs is only approximately 0.15 mm at optimum setting.

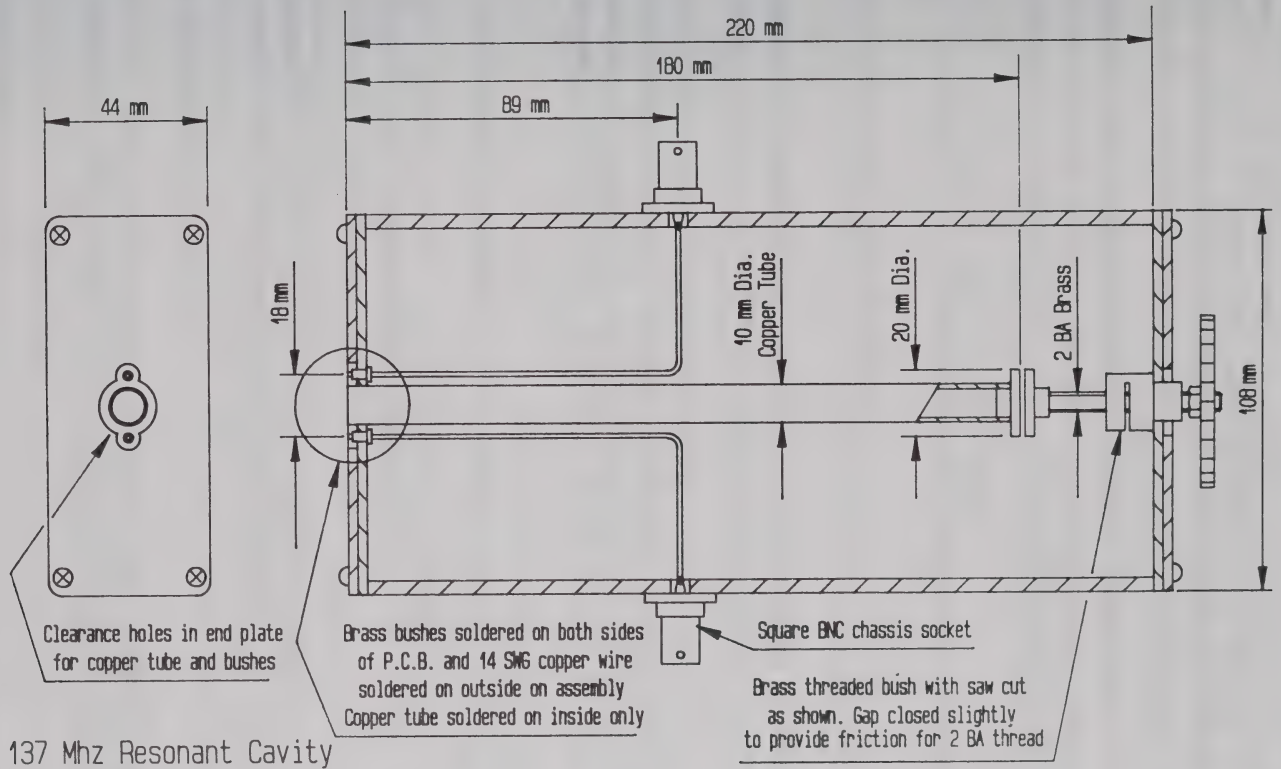
1 - The brass disc on the end of the copper tube must be flat and square to the tube axis. If possible, after soldering, turn the top face on a lathe.

2 - Ensure that the copper tube is at right angles to the P.C.B and true on centre line of the box when assembled.

3 - The disc on the 2 B.A. studding must be flat and square to the studding. If possible turn the face of the disc on a lathe.

4 - Assemble the 14 S.W.G. wire with the box assembled, poking the wire through the hole for the B.N.C. socket and the other end through the brass bush which should already be soldered in position (both sides)

Trim the end of the wire until the B.N.C. socket can be positioned correctly with the wire parallel to the copper tube. A small soldering iron can be used inside the box to solder the wire to the B.N.C. socket, and this sub-assembly is then removed by threading the wire back through the socket hole.


220 mm
180 mm
89 mm
44 mm
18 mm
10 mm Dia. Copper Tube
20 mm Dia.
2 BA Brass
108 mm
Clearance holes in end plate for copper tube and bushes
Brass bushes soldered on both sides of P.C.B. and 14 SWG copper wire soldered on outside on assembly Copper tube soldered on inside only
Square BNC chassis socket
Brass threaded bush with saw cut as shown. Gap closed slightly to provide friction for 2 BA thread

137 Mhz Resonant Cavity

5 - On final assembly, ensure that the faces of the P.C.B. and box are clean. Remove any tarnish with a fine abrasive, and clean again just before assembly. When you are satisfied that 14 S.W.G. wires are positioned correctly, solder them to the bushes and cut off the surplus wire.

6 - The aluminium end plates should be slightly bent such that when assembled the plates are pressing against the P.C.B.s.

Possible improvements to this design would be to increase the length to approx. 300 mm, and the tuning could possibly be a brass plug sliding inside a thin wall P.T.F.E. bush inside the end of the copper tube.

This design is a variation on a sketch of a Copper Tube Resonant Cavity sent to me by Peter Hayes of Ayr, Scotland.

CENTREFOLD PICTURE INFORMATION...

1. Sent in by Brian Taylor of Chobham, Surrey. An infra-red channel picture from NOAA11 on 9th. January 1992 at around mid-day, of N.W. Europe, together with an accompanying weather chart to help with analysis of the synoptic situation. The transmission was APT and received and processed using a Dartcom receiver and software. A camera was used to take a screen shot at slow shutter speed from the VGA monitor display, and the film developed. The resultant picture was taken to a printer with the latest generation of colour photo-copiers, and an area of the print selected, and an A4 print run off for about £1.20 .

2. To accompany a letter, Geo. H. Jillings from South Africa sent the mosaic of three Meteosat CTOT pictures, to show both the movement of systems, and the capabilities of the modified older Siemens Helifax facsimile machine used by him to produce the print.

WORD SEARCH

Peter Ball

S T I B R O A T D I P O L E G

G W R A L A T H C R L Y O Y E

N S N U O R F I E C N R A Y E

I C B N I W S D U A P C O R T

R A Z L J C O F E C A W G E I

E N S J O C R K E P R N B R L

T N T I E A O S P L I I Y A L

T E V D M N Y T Y G K F C W E

E R V E R N U E A Y S Y P T T

K U L G C O G M K D Q R B F A

I G Q N X Z I A G I U A P O S

W N L I G A Y B G S E M W S K

K M E T E O S A T H L I T E L

R E L P E K K M E D C R F D E

A N T E N N A O J P H P J T C

There are twenty words relevant to RIG hidden in the square.
They may be up, down, to the left or right,
or diagonally up or down.

Answers on page 63

RUSSIAN WEATHER SATELLITE OPERATIONS DURING AUTUMN 1991

Lawrence Harris

Interest has been expressed in the RIG magazine regarding the operations and manoeuvring of some of the METEOR weather satellite during October. I keep my Kepler element files up-to-date with help from NASA because I supply many readers of my column in Short Wave Magazine with this data, which, for many people not 'in the know' can be difficult to acquire! I include here detailed observations of that period from my log book.

At the beginning of September there were two METEOR satellites in operation: 3-4 (on 137.30MHz) and 2-19 (on 137.85MHz). In this band I also logged recordings of SERT 2 (on 136.23MHz), Transit (on 136.65MHz), and X3 (Prospero) on 137.56MHz. The latter could be heard transmitting in sunlight, and I made some efforts to finally identify it, after obtaining Kepler elements from NASA and Geoffrey Falworth of Penwortham.

Meanwhile, by mid-September METEOR 2-19 was approaching the morning terminator and I anticipated the switch-over to 2-20 at any time. This happened on September 16 when 2-20 was on for the 1908UTC pass, and 2-19 was found to be off.

Curious things then started to happen with METEOR 3-4! All was routine until September 22 when it was transmitting infra-red telemetry as expected at 1223UTC. Then, as expected, it switched over to visible. Then, catching me completely by surprise it reverted to infra-red again! At this time it was travelling north-bound at 40 degrees western elevation, and was therefore unlikely to be under command from the ground station. A later pass at 2000UTC was normal infra-red. METEOR 3-4 remained operating until 26th when it was off at 1117UTC. It came back on for 1843UTC and later passes, but the next day I logged it as being about 1 minute early, presumably as the result of a manoeuvre.

By October 2nd I was logging METEOR 3-4 as some 5 minutes early despite up-to-date elements and assumed that perhaps a further manoeuvre had been performed. The next intriguing observation I logged was on October 5th when 3-4 came on early and then cut-off at 1022UTC. The signal disappeared completely - but I continued to wait, just in case. Then at 1025UTC it came back on for three minutes and again switched off. Unusually there were no infra-red transmissions from 3-4 over that night (5th/6th) but the visible transmissions were normal, being received at

0957UTC on the 6th. This was still early.

If I was asked to give a possible explanation for this unusual activity I would suspect that METEOR 3-4 was having problems with its power supplies. The batteries on-board the British satellites UK5 and UK6 eventually became degraded and we (the operations team at Appleton and then Rutherford Laboratories) had to conduct operations within tight power constraints. A faulty battery or component on METEOR 3-4 would necessitate occasional operational constraints particularly when the satellite was near a terminator and therefore not receiving optimum illumination. I would add that I am not an expert on the power supplies of METEOR satellites - I am simply theorising on the basis of extensive experience with British satellites, and bow to anyone who knows the facts.

On the morning of October 10th I found a full tape of recorded METEOR infra-red data received overnight. I replayed it into my computer (using Timestep's brilliant PCSAT3 software), and could identify it as NOT from METEOR 3-4. I therefore checked and confirmed that it was from METEOR 3-5 received overnight - from a pass over the eastern Mediterranean sea. I used the InstantTrack software to correlate the picture view. In my opinion this software is one of the best satellite predictions programmes written and I have used it to identify specific METEOR series satellites when switches have been done. That same morning I was surprised to see METEOR 3-4 come up at 1038UTC and be still operating at 1233UTC. METEOR 3-5 came up at 1607UTC.

On October 12th METEOR 3-5 was experiencing problems. Its picture at 1610UTC had grey streaks and this fault continued on later passes. METEOR 3-4 was now off while in darkness, until October 15th when it was off completely. At this time the visible pictures from 3-5 were virtually blank, though I noticed that the aperture bars were operating normally.

METEOR 3-4 remained off, and 3-5 continued to operate with the fault condition. Infra-red pictures were OK but visible pictures were essentially blank. At 1300UTC on October 23 the fault condition had gone. By November 18th a new fault had appeared on METEOR 3-5 visible pictures but I did not log the exact date when it occurred. The visible picture resolution was drastically reduced.

On November 25 at 1217UTC METEOR 3-4 came over transmitting good quality pictures which were followed - while 3-4 was still up - by METEOR 3-5 transmitting infra-red pictures on the same frequency! The pictures

merged on my frame-store. No computer could have handled that one (sorry Dave!). Both 3-4 and 3-5 were still operating on the 26th but 3-5 was off for the 1000UTC pass. As of Mid-January it remains off.

I must point out that these observations are very detailed simply because I am now regrettably unemployed. I receive some renumeration from my column on weather satellites in Short Wave Magazine and little from occasional teaching of computer literacy and word processing. I do not recommend unemployment as providing an opportunity for excessive satellite monitoring!

Could I also mention that in a previous edition of RIG, my letter was chopped in half, completely losing the context. I had referred to the inevitable lateness of the Kepler elements in RIG (and not in the apparently critical way implied) and referred to my offer (published monthly in SWM) to provide any person with current Kepler elements for the cost of an S.A.E. The offer remains open to anyone who needs these. Experience has shown me just how difficult it can be for a newcomer to get recent ones.

Finally, if anyone wishes to comment on this METEOR matter perhaps they would write directly to me? I am all ears if someone knows the exact fault with these satellites.

LAWRENCE HARRIS
5 Burnham Park Rd., Peverell, PLYMOUTH, PL3 5QB

FOR SALE...

'Muirhead' K401-D Fax receiver, suitable for modification for weather satellite reception. (See RIG Newsletters No.'s 8-10) Complete with manual, circuit diagram and suitable toroidal transformer. £30 or WHY? (Buyer collects!!)

'Martelec' MSS20 WXsat interface for BBC computer, built from kit and installed in handsome case, with all leads, Eprom, original programme disk and manual. £50.

Tony Briggs, G0JND Telephone: Buxton (0298) 26800.

THE GIF PICTURE LIBRARY
By Mike Goodall

The following are available at present:
Disk 1 UK Noaa: in colour (x5)
Disk 2 UK Noaa: most in colour (x5)
Disk 3 Americas: various (x9)
Disk 4 Americas: various (x8)
Disk 5 Americas: various (x7)
Disk 6 Space: Spaceman, Launch, Mars, Venus, Saturn (x5)
Disk 7 Earth: various HRPT (x7)
Disk 8 Russian Meteor: Various (x5)
Disk 9 Various (x9)
Disk 10 Russian Meteor: USA (x3) [640x600x256 levels]
Disk 11 AusGMS and Noaas (x4) [up to 800x600x256 levels]
Disk 12 Mets and Noaas (x4) [up to 800x600x256 levels]
Disk 99 Shareware versions of viewing and tracking programs (zipped)
Disk 99A Shareware versions of viewing and tracking programs (zipped)
All pics are in PC GIF format; mostly 640x480x256 levels. Some are up to 800x600x256 levels. (All VPIC compatible)

How the system works: All disks will be copied for members free of charge, providing blank formatted disks are sent to me, with return addressed label and return postage. ***Maximum of 6 disks at any one time.***

Bearing in mind that most Library disks have approx. 1.2Mb on them, the best format to send is 1.4Mb HD 3.5". All other PC formats, 1.2Mb, 720kb and 360kb, can be copied to, but you will not get more than one or two on a 360kb disk! Please!!! Only legal PC formats (as above); none of those 720kB formatted to 1.44kB or vica versa, as I cannot handle them. Please send extra stamps if possible for me to return overseas enquiries post free.

Overseas Members: As above, but return post is free. I would appreciate any polar orbiter GIF files you have for the Library. Many members, including some overseas, have sent for copies; thanks for extra stamps sent. Also thanks to those who have sent in pictures for inclusion in the library, especially Charles Davis Sr. from Maryland, USA.

I have had a great response from the members wanting copies of the Library disks, and intend to increase the number of disks available in the future; good quality pics are always welcome from members and can be converted from most other picture formats to GIF format.

THE SOVIET AND CHINESE SCENE

Les Currington

As at January 1992

I think the most frequent remarks that I receive from new Satellite Weather watchers is why the pictures are so lacking in contrast at this time of the year, and why so little ground detail. In the first instance it is entirely due to lack of solar illumination as the METEORS only switch to visible transmission on a descending pass when reaching Scotland during mid-winter.

The second answer is that the scanning Telephotometer of the METEORS only covers the spectral wavelengths of 0.5 - 0.7 um, whereas the NOAA's cover the wavelength from 0.5 - 1.1 um. The Meteor wavelength does of course cover the yellow wavelength, which is why the North African and sandy regions show up in such detail. However the next few weeks should be showing excellent snow detail over Scandinavia and the frozen lakes of Finland.

I am frequently asked how I get such noise free pictures of long haul passes. The answer is that I use a 4 element cross yagi at the time of the AOS and then switch to omni crossed dipoles by means of a change-over relay on the receiver when the signal is of sufficient strength. By using a fast change-over relay no sign of any break in transmission is observed. By using the above method, noise free reception has been obtained of the Nile Delta and all of Iraq up to the Caspian Sea.

With the dramatic change around in the Soviet programme it will be of interest to see what effect this has on the number of weather satellite launches in the coming months. The stability of the pictures has greatly improved on METEORS 3-4 and 3-5 and I would expect this upgrading to continue in the near future.

The design of the METEOR spacecraft makes it possible to add extra instrumentation which is mounted onto a platform below the cylindrical satellite support system; so who knows, we could see HRPT or possibly a greater spectral range.

METEOR 3-4 1991-30A 137.3 mHz.
METEOR 2-20 1990-86A 137.85 mHz.
Feng Yun 1-b 1990-81 137.8 mHz (if on)

KEPLER ELEMENTS
Provided by Max White - Kettering Group

	NOAA 9	NOAA 10	NOAA 11
	137.62 MHz	137.50 MHz	137.62 MHz
	84-123	86-73	88-89
EPOCH OF DATA	92037.07058681	92037.05332039	92037.13369483
ACCELERATION	0.00001111	0.00001772	0.00001641
REV NO.	36855	27984	17349
INCLINATION	99.1550	98.5451	99.0648
R. A. NODE	61.1042	60.1539	359.0712
ECCENTRICITY	0.0016060	0.0012425	0.0012551
ARG OF PERIGEE	126.1274	330.8156	40.7534
MEAN ANOMALY	234.1391	29.2286	319.4533
MEAN MOTION	14.13282404	14.24507174	14.12527556

	NOAA 12	MET 2-16	MET 2-17
	137.50 MHz	137.85 MHz	137.30 MHz
	91-32	87-68	88-05
EPOCH OF DATA	92037.09136640	91283.02197901	92030.60196307
ACCELERATION	0.00002088	0.00000127	0.00000137
REV NO.	3799	20934	20215
INCLINATION	98.7107	82.5544	82.5410
R. A. NODE	68.7437	269.9326	239.4337
ECCENTRICITY	0.0012863	0.0012811	0.0017598
ARG OF PERIGEE	207.9978	354.4558	97.0382
MEAN ANOMALY	152.0492	5.6457	263.2776
MEAN MOTION	14.21849377	13.83839899	13.84590279

	MET 2-18	MET 2-19	MET 2-20
	137.30 MHz	137.85 MHz	137.85 MHz
	89-18	90-57	90-86
EPOCH OF DATA	92037.16042474	92035.40538736	92036.25191454
ACCELERATION	0.00000350	0.00000181	0.00000317
REV NO.	14842	8112	6843
INCLINATION	82.5217	82.5462	82.5259
R. A. NODE	111.1520	174.5145	112.5257
ECCENTRICITY	0.0014521	0.0017097	0.0013223
ARG OF PERIGEE	121.1068	51.4141	312.3428
MEAN ANOMALY	239.1591	308.8561	47.6613
MEAN MOTION	13.84243534	13.84069839	13.83453194

	OKEAN 2	OKEAN 3	MET 3-2
	137.40 MHz	137.40 Mhz	137.30 MHz
	90-18		88-64
EPOCH OF DATA	91289.61720472	91289.07344084	92026.99610901
ACCELERATION	0.00004080	0.00002134	0.00000050
REV NO.	8774	1970	16845
INCLINATION	82.5235	82.5244	82.5413
R. A. NODE	8.9399	278.3428	220.8241
ECCENTRICITY	0.0020420	0.0023321	0.0016658
ARG OF PERIGEE	130.2755	190.9139	285.6730
MEAN ANOMALY	230.0239	169.1592	74.2553
MEAN MOTION	14.75775906	14.74165292	13.16940538

	MET 3-3	MET 3-4	MET 3-5
	137.85 MHz	137.30 MHz	137.85 MHz
	89-86	91-30	91-56
EPOCH OF DATA	92036.81879775	92021.62705061	92036.97936486
ACCELERATION	0.00000043	0.00000043	0.00000440
REV NO.	10968	3586	2298
INCLINATION	82.5623	82.5493	82.5557
R. A. NODE	155.7603	70.1989	5.6451
ECCENTRICITY	0.0014484	0.0017188	0.0013305
ARG OF PERIGEE	272.5950	230.3947	186.2675
MEAN ANOMALY	87.3516	129.5661	173.8201
MEAN MOTION	13.15982640	13.16767075	13.16799454

ALL KEPLERS ARE THE LATEST AVAILABLE AT TIME OF GOING TO PRESS

TIMESTEP BULLETIN BOARD

There is now operating, 24 hours a day, a Bulletin Board that you can use to download Keplers and get other information regarding latest developments in the Weather Sat scene. The Keplers are updated every Friday and are in Amsat and 2-line format, plus IT.ORB for Instantrack.

The number is 0440 820002, and the protocol is the normal standard 8 bit, no parity, 1 stop bit.

SOVIET REFERENCE ORBITS

Simon Goodall

These are the times of north bound equator crossings (in GMT) and longitudes (in degrees west) for two Soviet satellites. They are given at weekly intervals together with the period and the change in longitude per orbit.

MET 2-20

period 104.14 minutes increment 26.16 degrees

28 MAR 16.27 003	04 APR 15.05 355	11 APR 15.27 012	18 APR 14.04 004
25 APR 12.42 356	02 MAY 13.04 014	09 MAY 11.41 006	16 MAY 10.19 357
23 MAY 10.41 015	30 MAY 09.18 007	06 JUN 07.56 359	13 JUN 06.33 351

MET 3-4

period 109.42 minutes increment 27.48 degrees

28 MAR 13.38 008	04 APR 13.24 016	11 APR 11.21 357	18 APR 11.07 006
25 APR 10.54 014	02 MAY 08.50 355	09 MAY 08.37 003	16 MAY 08.23 012
23 MAY 06.20 352	30 MAY 06.06 001	06 JUN 05.52 009	13 JUN 03.49 350

Compiling the Soviet Reference Orbits has been difficult this time as the only Russian satellites known to be operating regularly at the time of writing are Met2-20 and Met3-4. Okean3 has had an occasional burst of activity, but no Keplers have been published for this satellite since October, rendering any predictions useless.

Due to recent occurrances in the now called Commonwealth of Independant States (formally USSR) we have received no information or reports on the satellite front.

USING PUBLISHERS'S PAINTBRUSH v2.

Gordon Train

I have recently purchased a copy of Publisher's Paintbrush v2. This is a painting and image editing program that runs on PCs under Windows 3. Although I haven't had the opportunity to fully use the program yet, I thought I'd give you a quick review of the features that may be useful for converting and /or editing Weather Satellite pictures, as produced by PCSAT3, PROSAT2 and presumably other PC based systems.

Loading the pictures

The program can load images in many formats, including PCX, GIF, TIFF, BMP & RAW.

The format quickly recognised by PCSAT3 & PROSAT2 users will by GIF, if you have ever converted your images for VPIC. The RAW format is for loading uncompressed image data. This is compatible with .NOA and .DAT formats and therefore is ideal for loading PCSAT3 and PROSAT2 images directly.

When using the RAW format, you must specify the size of the image.

For .DAT this is Width: 640 and Lines: 800
For .NOA this is Width: 1200 and Lines: up to 2000

The palette will automatically be 256 level grey scale when loaded. Whether or not it will be displayed as such will obviously depend on your computer configuration and your Windows 3 display drivers.

Until I finally mastered the Memory set-up for Windows and Publishers Paintbrush, I was getting errors telling me "Not Enough Memory to display picture !" and "Not enough Memory to Create picture!" and I'm using 4mb RAM !!. The loading of .NOA pictures can be fairly slow but they can be 2.4mb long so I wasn't surprised.

Converting the Pictures

Once you've loaded the picture into the program you can now view the image in fine detail with the ZOOM facility, this ranges from 3% to 3200%! (Normal is 100%).

If you want to display the whole image on the screen at the same time you can zoom out but this tends to make the image rather too small, the

alternative is to convert the image to different size. I operate Windows in 800x600 with 256 colours, so I convert the pictures to this size.(If you want to maintain the aspect ratio you can scale the height / width accordingly). Once converted you can then use SHOW SCREEN to show the full-screen image.

Now you have converted the picture so that it will fit on the screen you could now simply save the picture in your required format. (NOTE: you cannot re-save in .RAW format, so unfortunately you cannot edit pictures and then view them using PCSAT3 or PROSAT2 (Any chance of Timestep modifying PROSAT2 to read other formats ?)

Editing the Pictures

The are many options available for editing and drawing pictures, too many to mention here, so I'll just mention the useful ones I've found for editing Weather satellite pictures.

Useful options for WSat pictures are INVERT (inverts Met3 series IR), FLIP VERTICALLY & HORIZONTALLY (for descending/ascending).

There are several FILTERS you can apply to the whole of the image or a user-defined area of the image (this can even be an irregular shape). You can also screen preview the effect before committing yourself.

The useful ones for WSat pictures are EQUALIZE (similar to PROSAT2, BUT you have total control of the corrections it makes), this adjusts brightness & contrast for optimum display, you can apply different equalisation to each channel of a NOAA picture to optimise Visible & IR, whilst leaving the grey scale unchanged !,REMOVE SPOTS, RESPONSE CURVE (you can draw your own response curves to correct for monitor,printer etc!!, (you can even use it to try and enhance the dark areas in Russian pictures), SHARPEN (again similar to PROSAT2 BUT again you have control of the amount of correction in %) and BLEND to smooth the image.

To remove those annoying dropouts in a picture you can manual paint over them. There is a EYE-DROP function which allows you to read a shade from the screen and then use it as the palette colour, this makes 'spotting' very simple. With some practice it's possible to remove whole lines of interference, or even more advanced you can fill in areas lost due to interference etc. by copying areas from else where in the picture and hand correcting them.

If you have a picture which has 'slipped' part way through you can re-aligned it by moving the sections. Text may also be added to your pictures.

The paint options are only limited by your artistic skills.

If you wish to colour the 256 grey scale image, you can convert it to 256 colour. Pictures can be converted to 24 bitmaps, but I haven't mastered that yet, I seem to end up with very few levels. (may be lack of memory). With colour you can choose from 16.7 million colours !.

With 256 colour images you can build your own palettes, and end up with results similar to PCSAT3 or PROSAT2, or you can modify the picture such that you can have different palettes for different areas, such as Visible & Infra Red on NOAA images, I've found it useful to have the Visible in Grey scale and the Infra-Red in colour.

As you can see this program offers some excellent options if you are interested in correcting your Weather satellite pictures and image enhancement. There are also options for combining images together. The output in GIF can be used for the VPIC program and the Picture Library.

The Snags !

Unfortunately you need to own Windows 3, fortunately a lot of PCs are supplied with it now, and extended memory would seem to be vital. The programs alone occupy 7mb of hard-disk space, so you'll have to do something with all those Satellite Pictures occupying space in there!.

The set-up, as I mentioned earlier, can be confusing to get right. You have to deal with XMS, EMS, Windows SWAPFILES and VirtualMemory !! (and they try to tell you windows is a user-friendly interface). I ended up with 2 versions of Boot-up files which I have to swap and then re-boot when I want to switch between windows and other uses.

The final thing is price, it's not cheap at £253 inc VAT etc, (it's available from companies such as Technomatic etc), but the good news is I've seen in a PC magazine this month a program called PhotoFinish by the same company (ZSoft) which is a cut down version for £145 (this is RRP, so it will be cheaper) but make sure what has been cut-out before you buy it to edit those Weather Satellite pictures.

FURTHER NOISE MEASUREMENTS

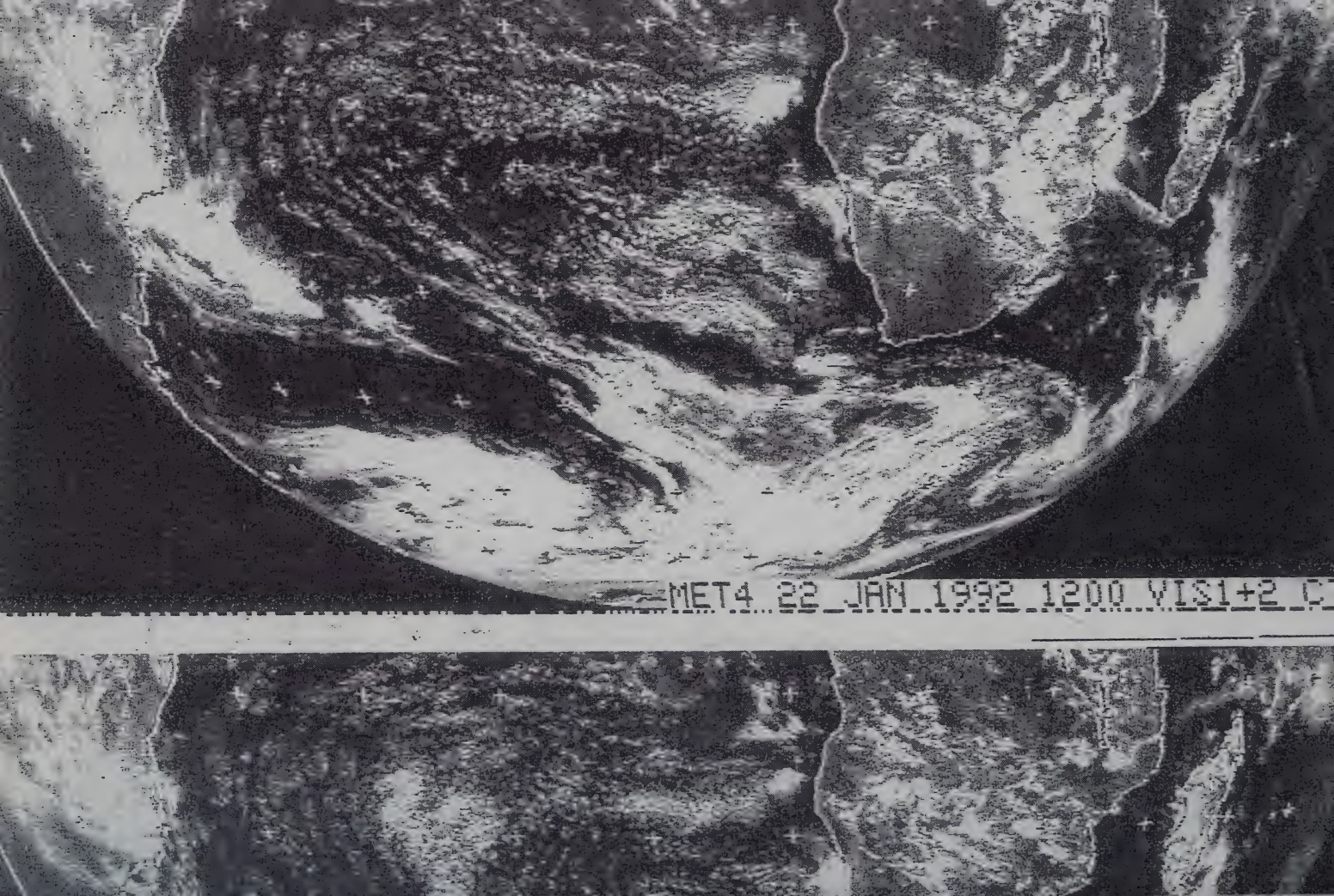
Mike Goodall

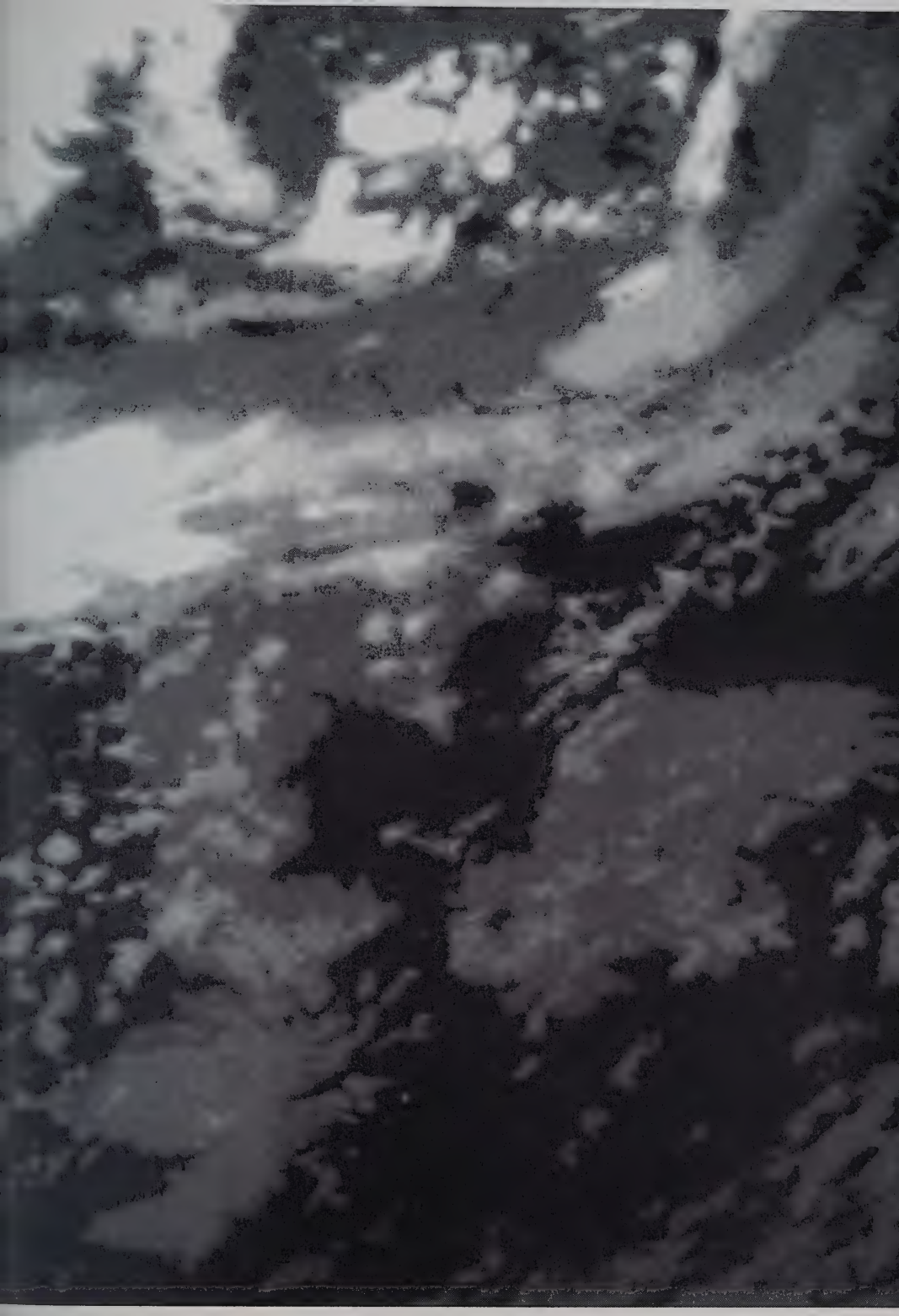
Further to my article in RIG24 I have been carrying out some more noise figure measurements on the Meteosat set-up with the aid of a small Timestep utility program called "SNOISE". This is designed to work only with the Prosatll system.

To use the system you first run the 'Level' program, set to 'Geostationary' and set the level to 200-220. 'Snoise' is then run and you sit back and wait for the results. The program is triggered by the start tone and samples the white phasing bars that appear before the picture data starts. It gives a reading of the apparent percentage noise figure (to 2 decimal places), a dB signal to noise ratio, and the average level set. These are mechanically produced figures without any human bias!

The results tie in nicely with the ones that I had obtained by measuring the pixel values, as in my last article. However, 'Snoise' is obviously a more accurate system. The first results showed levels around 1.9%. Incidentally you have to take several sequential readings and average them out. With a little tweaking of the RX this was reduced to a average of 1.7%, a slight improvement.

After monitoring the system over the early morning to late evening period, I was surprised to see as much deviation from the average. (The program writers were also surprised to see a variation as much as 0.5dB in signal-to-noise ratio). Sequential readings can sometimes vary between 1.3% and 1.5%, although averaging 5 or 6 readings brings up a believable figure. The morning readings were about 1.75% which lasted till after noon. Then came the surprise. They gradually dropped off during the afternoon, eventually reducing to 1.06%. Taking an image to check every now and then, revealed quite a dramatic improvement. At 1.06% there was hardly any noise discernable in the white areas. I was sure that a noise figure of below 1% would eradicate it all. After a while, by observing white areas on the pics you can quite accurately estimate the noise. At 2% the white looks a little patchy. At 1.5% a just acceptable picture is reached. But 1% results in a highly acceptable image. It must be remembered thought that the small difference between 1% and 2% actually means twice the amount of noise. The dramatic variations in the readings during the day is believed to be caused by the atmosphere and the amount of water it contains, although temperature conscious receivers, pre-amps and downconverters could account for a small amount.


MET4 22 JAN 1992 1200 VIS1+2 C



NOAA 9 PERIOD 101.94 MINS FREQUENCY 137.62MHz

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

1992			1992			1992		
01/04	07.25	17.16	01/05	07.46	17.37	01/06	07.51	17.42
02/04	07.12	18.45	02/05	07.33	17.24	02/06	07.38	17.29
03/04	06.59	18.32	03/05	07.20	18.53	03/06	07.25	18.58
04/04	06.46	18.19	04/05	07.07	18.40	04/06	07.12	18.45
05/04	08.15	18.06	05/05	06.54	18.27	05/06	06.59	18.32
06/04	08.03	17.53	06/05	08.23	18.14	06/06	08.28	18.19
07/04	07.50	17.41	07/05	08.10	18.01	07/06	08.15	18.06
08/04	07.37	17.28	08/05	07.57	17.48	08/06	08.02	17.53
09/04	07.24	17.15	09/05	07.44	17.35	09/06	07.49	17.40
10/04	07.11	18.44	10/05	07.31	17.22	10/06	07.36	17.27
11/04	06.58	18.31	11/05	07.18	18.51	11/06	07.23	18.56
12/04	08.27	18.18	12/05	07.05	18.38	12/06	07.10	18.43
13/04	08.14	18.05	13/05	06.52	18.25	13/06	06.57	18.30
14/04	08.01	17.52	14/05	08.21	18.12	14/06	08.26	18.17
15/04	07.49	17.39	15/05	08.08	17.59	15/06	08.13	18.04
16/04	07.36	17.26	16/05	07.55	17.46	16/06	08.00	17.51
17/04	07.23	18.56	17/05	07.42	17.33	17/06	07.47	17.38
18/04	07.10	18.43	18/05	07.29	17.20	18/06	07.34	17.25
19/04	06.57	18.30	19/05	07.16	18.49	19/06	07.21	18.53
20/04	08.26	18.17	20/05	07.03	18.36	20/06	07.08	18.40
21/04	08.13	18.04	21/05	08.32	18.23	21/06	08.36	18.27
22/04	08.00	17.51	22/05	08.19	18.10	22/06	08.23	18.14
23/04	07.47	17.38	23/05	08.06	17.57	23/06	08.10	18.01
24/04	07.34	17.25	24/05	07.53	17.44	24/06	07.57	17.48
25/04	07.21	18.54	25/05	07.40	17.31	25/06	07.44	17.35
26/04	07.08	18.41	26/05	07.27	19.00	26/06	07.31	19.04
27/04	06.55	18.28	27/05	07.45	18.47	27/06	07.18	18.51
28/04	08.24	18.15	28/05	07.01	18.34	28/06	07.05	18.38
29/04	08.12	18.02	29/05	08.30	18.21	29/06	08.34	18.25
30/04	07.59	17.49	30/05	08.17	18.08	30/06	08.21	18.12
----------			31/05	08.04	17.55	----------		

MORNING PASSES ARE SOUTHBOUND EVENING PASSES ARE NORTHBOUND

NOAA 10 PERIOD 101.13 MINS FREQUENCY 137.50MHz

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

1992			1992			1992		
01/04	06.39	18.07	01/05	08.02	17.48	01/06	07.16	17.02
02/04	07.56	17.43	02/05	07.38	17.24	02/06	06.51	18.19
03/04	07.32	17.18	03/05	07.13	17.00	03/06	06.27	17.54
04/04	07.08	18.35	04/05	06.49	18.17	04/06	07.44	17.30
05/04	06.44	18.11	05/05	08.06	17.52	05/06	07.19	17.06
06/04	08.01	17.47	06/05	07.42	17.28	06/06	06.55	18.22
07/04	07.37	17.23	07/05	07.17	17.04	07/06	06.31	17.58
08/04	07.13	18.40	08/05	06.53	18.20	08/06	07.47	17.33
09/04	06.48	18.16	09/05	06.29	17.56	09/06	07.23	17.09
10/04	08.05	17.51	10/05	07.46	17.32	10/06	06.59	18.26
11/04	07.41	17.27	11/05	07.21	17.08	11/06	06.34	18.01
12/04	07.17	17.03	12/05	06.57	18.24	12/06	07.51	17.37
13/04	06.53	18.20	13/05	06.33	18.00	13/06	07.26	17.13
14/04	06.28	17.56	14/05	07.50	17.36	14/06	07.02	18.29
15/04	07.45	17.32	15/05	07.25	17.11	15/06	06.38	18.05
16/04	07.21	17.07	16/05	07.01	18.28	16/06	07.54	17.40
17/04	06.57	18.24	17/05	06.37	18.04	17/06	07.30	17.16
18/04	06.33	18.00	18/05	07.53	17.40	18/06	07.05	18.33
19/04	07.50	17.36	19/05	07.29	17.15	19/06	06.41	18.08
20/04	07.25	17.12	20/05	07.05	18.32	20/06	07.58	17.44
21/04	07.01	18.28	21/05	06.40	18.08	21/06	07.33	17.19
22/04	06.37	18.04	22/05	07.57	17.43	22/06	07.09	18.36
23/04	07.54	17.40	23/05	07.33	17.19	23/06	06.44	18.12
24/04	07.30	17.16	24/05	07.09	18.36	24/06	08.01	17.47
25/04	07.05	18.33	25/05	06.44	18.11	25/06	07.36	17.23
26/04	06.41	18.08	26/05	08.01	17.47	26/06	07.12	16.58
27/04	07.58	17.44	27/05	07.37	17.23	27/06	06.48	18.15
28/04	07.34	17.20	28/05	07.12	16.58	28/06	08.04	17.50
29/04	07.09	18.37	29/05	06.48	18.15	29/06	07.40	17.26
30/04	06.45	18.12	30/05	08.05	17.51	30/06	07.15	17.01
----------			31/05	07.40	17.26	----------		

MORNING PASSES ARE SOUTHBOUND EVENING PASSES ARE NORTHBOUND

NOAA 11 PERIOD 101.98 MINS FREQUENCY 137.62MHz

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

1992			1992			1992		
01/04	02.49	14.22	01/05	03.30	13.22	01/06	03.57	13.48
02/04	02.37	14.10	02/05	03.18	13.09	02/06	03.44	13.35
03/04	04.07	13.38	03/05	03.06	14.39	03/06	03.32	13.23
04/04	03.54	13.46	04/05	02.54	14.27	04/06	03.20	13.11
05/04	03.42	13.33	05/05	02.41	14.15	05/06	03.07	14.40
06/04	03.30	13.21	06/05	04.11	14.02	06/06	02.55	14.28
07/04	03.18	13.09	07/05	03.59	13.50	07/06	02.42	14.15
08/04	03.06	14.39	08/05	03.47	13.38	08/06	04.12	14.03
09/04	02.53	14.27	09/05	03.34	13.25	09/06	04.00	13.51
10/04	02.41	14.14	10/05	03.22	13.13	10/06	03.47	13.38
11/04	04.11	14.02	11/05	03.10	14.43	11/06	03.35	13.26
12/04	03.59	13.50	12/05	02.57	14.30	12/06	03.22	13.13
13/04	03.47	13.38	13/05	02.45	14.18	13/06	03.10	14.43
14/04	03.34	13.26	14/05	04.15	14.06	14/06	02.58	14.31
15/04	03.22	13.13	15/05	04.02	13.54	15/06	02.45	14.18
16/04	03.10	14.43	16/05	03.50	13.41	16/06	04.15	14.06
17/04	02.58	14.31	17/05	03.38	13.29	17/06	04.02	13.53
18/04	02.46	14.19	18/05	03.25	13.17	18/06	03.50	13.41
19/04	04.15	14.07	19/05	03.13	14.46	19/06	03.37	13.29
20/04	04.03	13.54	20/05	03.01	14.34	20/06	03.25	13.16
21/04	03.51	13.42	21/05	02.48	14.22	21/06	03.13	14.46
22/04	03.39	13.30	22/05	04.18	14.09	22/06	03.00	14.33
23/04	03.26	13.18	23/05	04.06	13.57	23/06	02.48	14.21
24/04	03.14	13.05	24/05	03.53	13.45	24/06	04.17	14.08
25/04	03.02	14.35	25/05	03.41	13.32	25/06	04.05	13.56
26/04	02.50	14.23	26/05	03.29	13.20	26/06	03.52	13.43
27/04	02.38	14.11	27/05	03.16	13.08	27/06	03.40	13.31
28/04	04.07	13.58	28/05	03.04	14.37	28/06	03.27	13.19
29/04	03.55	13.46	29/05	02.52	14.25	29/06	03.15	14.48
30/04	03.43	13.34	30/05	04.21	14.12	30/06	03.03	14.36
----------			31/05	04.09	14.00	----------		

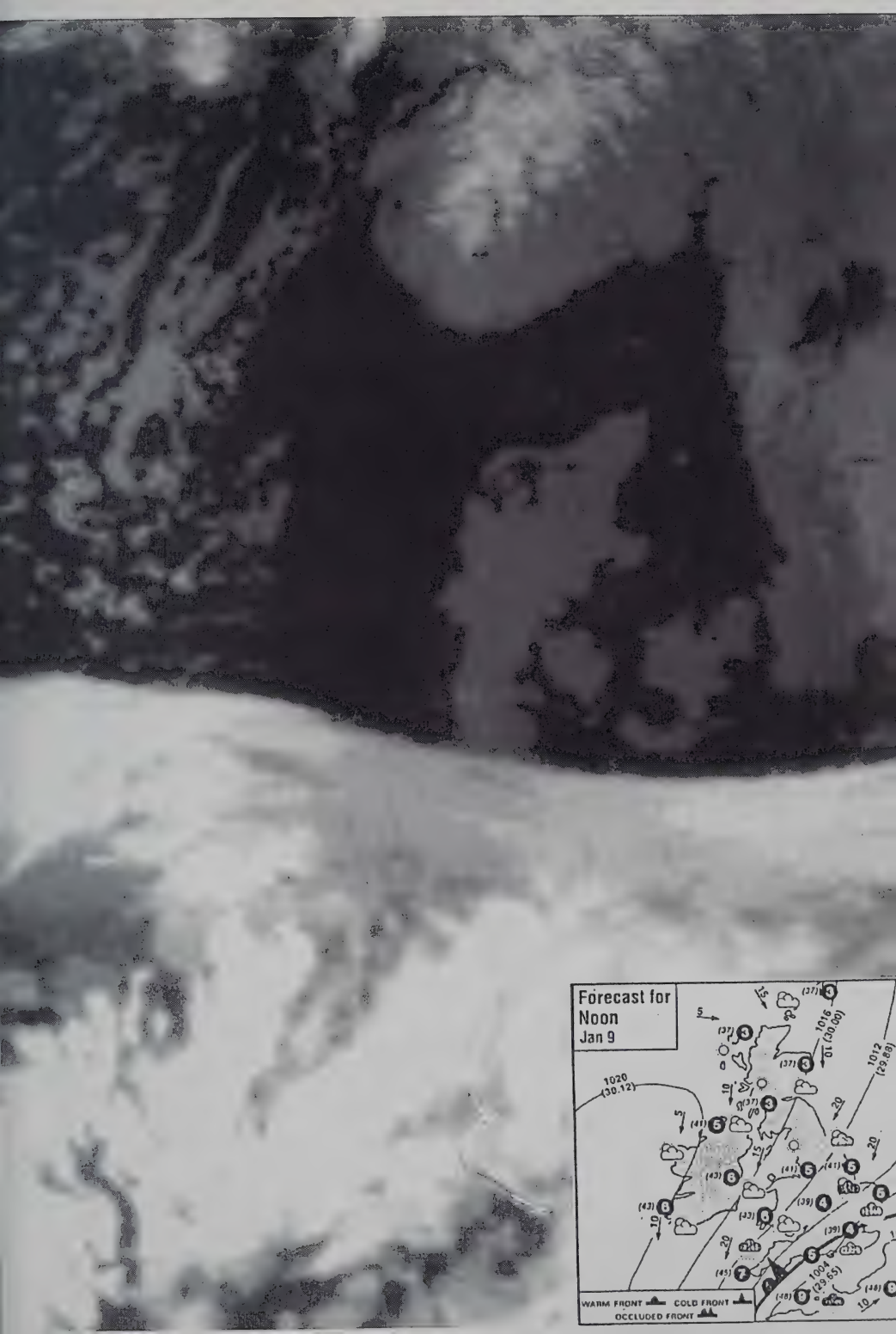
MORNING PASSES ARE SOUTHBOUND EVENING PASSES ARE NORTHBOUND

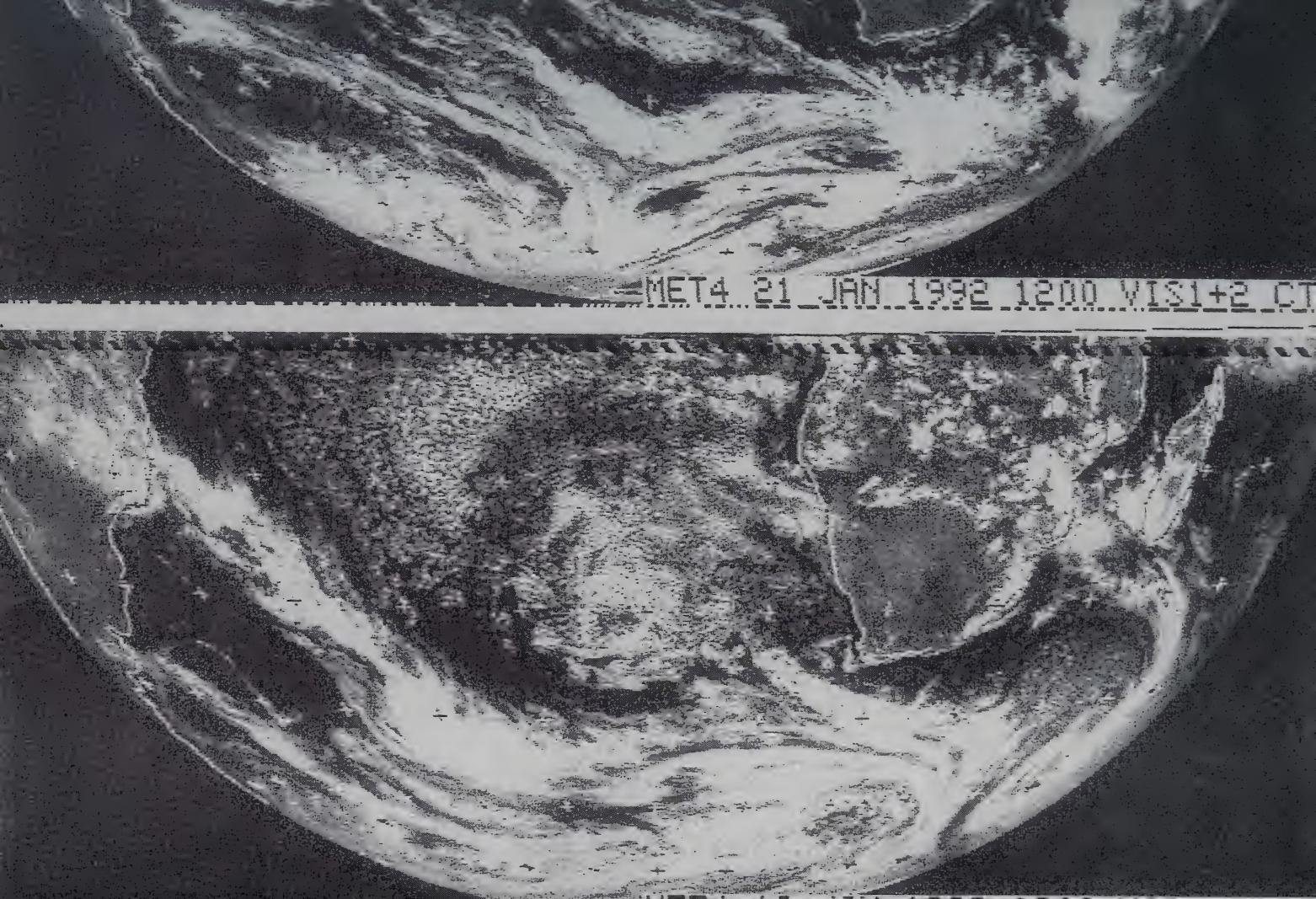
NOAA 12 PERIOD 101.31 MINS FREQUENCY 137.50MHz

TIME OF ACQUISITION OF SIGNAL - 52.5 DEG NORTH 0 DEG EAST

1992			1992			1992		
01/04	08.20	18.08	01/05	07.40	19.08	01/06	08.15	18.02
02/04	07.59	17.46	02/05	07.18	18.46	02/06	07.53	17.40
03/04	07.37	19.06	03/05	08.38	18.25	03/06	07.31	18.59
04/04	07.16	18.44	04/05	08.16	18.03	04/06	07.09	18.38
05/04	08.35	18.23	05/05	07.54	17.41	05/06	08.29	18.16
06/04	08.14	18.01	06/05	07.32	19.01	06/06	08.07	17.54
07/04	07.52	17.39	07/05	07.11	18.39	07/06	07.45	19.13
08/04	07.31	18.59	08/05	08.30	18.18	08/06	07.23	18.52
09/04	07.09	18.38	09/05	08.09	17.56	09/06	08.43	18.30
10/04	08.29	18.16	10/05	07.47	19.15	10/06	08.21	18.08
11/04	08.07	17.54	11/05	07.25	18.54	11/06	07.59	17.46
12/04	07.46	19.14	12/05	08.45	18.32	12/06	07.37	19.06
13/04	07.24	18.53	13/05	08.23	18.10	13/06	07.15	18.44
14/04	08.44	18.31	14/05	08.01	17.49	14/06	08.35	18.22
15/04	08.22	18.09	15/05	07.40	19.08	15/06	08.13	18.00
16/04	08.02	17.48	16/05	07.18	18.46	16/06	07.51	17.38
17/04	07.39	19.07	17/05	08.37	18.25	17/06	07.29	18.57
18/04	07.17	18.46	18/05	08.16	18.03	18/06	07.07	18.36
19/04	08.37	18.24	19/05	07.54	17.41	19/06	08.26	18.14
20/04	08.15	18.02	20/05	07.32	19.01	20/06	08.05	17.52
21/04	07.54	17.41	21/05	07.10	18.39	21/06	07.43	19.11
22/04	07.32	19.01	22/05	08.30	18.17	22/06	07.21	18.49
23/04	07.10	18.39	23/05	08.08	17.55	23/06	08.40	18.27
24/04	08.30	18.17	24/05	07.46	19.15	24/06	08.18	18.06
25/04	08.08	17.56	25/05	07.25	18.53	25/06	07.56	17.44
26/04	07.47	19.15	26/05	08.44	18.31	26/06	07.34	19.03
27/04	07.25	18.54	27/05	08.22	18.10	27/06	07.13	18.41
28/04	08.45	18.32	28/05	08.00	17.48	28/06	08.32	18.19
29/04	08.23	18.10	29/05	07.39	19.07	29/06	08.10	17.57
30/04	08.01	17.49	30/05	07.17	18.45	30/06	07.48	19.17
---	---	---	31/05	08.36	18.24	---	---	---

MORNING PASSES ARE SOUTHBOUND EVENING PASSES ARE NORTHBOUND


Forecast for
Noon
Jan 9
1020
(30.12)
1016
(30.00)
1012
(29.88)
1004
(29.65)
WARM FRONT
COLD FRONT
OCCLUDED FRONT


METEOSAT 21 JAN 1992 1200 VIS1+2 CI

I suppose, strictly speaking, if you had your range set up as Black = 0 White = 255, the 1% would cover a range of 2.5 grey levels, and 2% would cover 5 grey levels. Ideally, then, the noise figure should be less than 0.4% for a completely noise-free image. Whether this figure of is obtainable, is open to speculation, as there must be some noise generated in the RX stages, as well as the PC card in the computer. The A-D converter on the card itself can only accurately generate plus or minus one greyscale for any given input level, which would account for a noise figure of around 0.4% In practice, however, anything less than 1.0% will be highly acceptable.

Further adjustments were made to the antenna; a shifting of the rim of the dish by 1.5" made a great improvement, and careful retuning of the downconverter oscillator and 137.5MHz receiver made further improvements. The best results were 0.9% (CH1) and 0.7% (CH2). These figures produced highly acceptable results and hardly any noise was visible when zoomed in on the image. However these figures are the best results. On a really bad day it is possible for them to rise to as high as 2%.

Of course, it is possible, if your RX audio filtering was adjusted to pass a 2.4KHz signal perfectly, but little else, you would probably achieve a 0.5% or better reading; but the overall picture would be appalling. On the other hand, if your filtering tailed off to quickly at 2.2KHz, you may have a reasonable picture, but a poor noise figure reading at 2.4KHz. However, with the standard receivers being used with down-converters for Meteosat, the results are likely to be relatively accurate.

The program is intended to be used to improve overall results, and to compare noise figures from one set-up to another. A copy of the program is available to ProsatII users from the Chairman; Please supply disc (any format) and S.A.E for return.

K. Wenger writes in from Switzerland to send data sheets from a firm called SIBALCO who market the much sought after Blue LED's. There are two versions marketed by the Swiss firm: a B31D with a 6 mcd output, and the B51 with a 12 mcd output. *[ED. Maplin does blue LED's with 15 mcd output.]* The sheets have been passed to Henry, so all enquiries to the Chairman please.
[All these blue LEDs are inefficient dim types, and also expensive - Henry.]

A NEW BRIGHTER NOAA

By Michael Takier
Space Research Federation, Washington

Dark visual pictures in the winter from the Noaa satellites could be a thing of the past when Noaa13 is launched next year. The first proposed launch date is 1.4.93, but going by past experiences this could be much later in the year.

The new Noaa will have an increased power supply unit, with solar powered batteries as a back-up. This extra power will be utilised in a novel way. There will be two powerful Quartz-Halogen lamp units, with specially tailored optics that will produce a near-parallel beam. This will be synchronised with the normal scanning equipment to illuminate the spot on the Earth that the visual sensor is scanning. They will be switched on automatically when the light falls below a set level, similar to the double infra-red format that is used at present during the night hours.

It is expected that the results with the extra illumination will be similar to the visual pictures that are received in mid-summer around noon. This will mean that useable pictures throughout the 24 hour period will be available, enabling the special mixing techniques of Vis and Infrared, such as vegetation indices, to be produced at times other than mid-summer.

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THE VHF RECEIVER

Roger Belcher

Introduction (Part 2)

This article is intended to:

1. review the parameters used to specify superhet receiver.
2. present a specification that will meet the needs of current and future APT receivers.
3. "point the way" as to how this specification can be realised using readily available RF components and conventional receiver construction techniques.

Receiver Parameters

The FREQUENCY RANGE over which the receiver will operate is the total frequency span (max. to min.) over which it is capable of meeting its full specification. This is a function of the bandwidth of the pre-select filters and the frequency range of the local oscillator (LO).

The FREQUENCY RESOLUTION is the finest increment to which the receiver can be tuned. At present three basic methods of tuning are used.

One type is the free running oscillator. This is tuned either by a mechanical capacitor or by a variable capacitance diode fed with an adjustable DC voltage. The problem with this adjustable system is the setting (and re-setting) accuracy required to centre the tuning on each satellite channel and the inability to have remote or computer control. A second problem is one of stability. As there is no crystal stabilization involved in the receiver tuning it is open to temperature drift effects and mechanical instability (microphony). However, resolution is theoretically infinite.

A second type of receiver tuning uses fixed crystal control. In this method an individual crystal is used for each satellite channel to be received. It can achieve the requirement of high stability and low noise local oscillator injection (if designed correctly!), however the problem is one of flexibility. If new channels are required to be added it is necessary to purchase new crystals from the manufacturer - and hope there is provision to fit them in the receiver. The incremental setting resolution is not really relevant to this system.

The third type of receiver tuning is obtained using a frequency synthesizer module as the LO. This employs a circuit technique known as a phase lock loop. This system has the advantage of fine step tuning coupled with crystal control stability. The receiver can be very easily tuned from channel to channel by the operator. It can also be controlled remotely or through a computer interface. The tuning step size resolution is a function of the synthesizer design. This is a highly recommended system as with sufficiently small step size any future satellite frequency can be received.

TUNING STABILITY is the ability for the receiver to remain accurately on channel over long time periods, ambient temperature changes and mechanical disturbances. Crystal control and frequency synthesized receivers should meet this specification without difficulty but free running oscillator tuning will have difficulties. In the case of the synthesizer the stability is given by the performance of the reference crystal. For the separate channel crystal controlled receiver each channel must be individually specified or the crystal specifications matched.

SENSITIVITY relates to the signal to noise performance of the receiver. This parameter merits a more detailed examination.

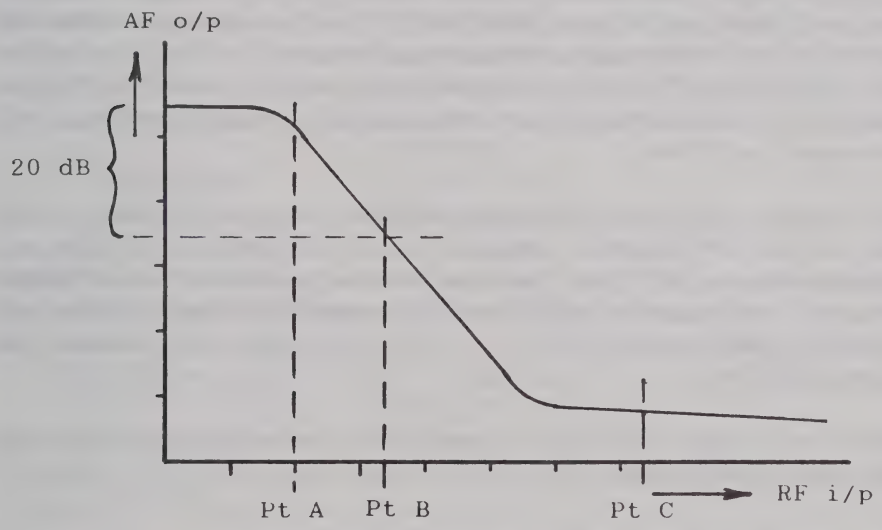
If we consider the action of the superhet receiver under conditions of very small through to very large signal conditions, we can define parameters used to quantify these specifications.

In a well designed receiver the noise appearing at the output under very low signal conditions will be the noise generated in the first gain stage of the receiver and the sum of all the losses before it (antenna feeds, connectors, etc.). The noise occuring in the first gain stage is unavoidable and is due primarily to random current effects. Under no signal input conditions, this noise is converted by the mixer down to the IF, is bandwidth limited by the IF filters and passed on to the IF amplifier chain. The noise level at this point will not be sufficient to drive any but the last stage of the IF amplifier chain into limit. The hissing noise heard in the speaker under these conditions is the amplified noise of the first stage. The popping noise that accompanies it is the last stage of the IF amplifier chain dropping in and out of limit.

If we now introduce a very small RF signal into the receiver input, it will appear on the IF amplifier chain. As we increase the strength of the input signal, the last stage of the IF amplifier will be driven fully into limit and then this limiting action will move back down the IF chain as the signal level

is further increased. As each succeeding stage is driven into limit, the total gain provided by the IF amplifier falls. (This means the signal presented to the input of the FM demodulator remains constant in spite of increasing RF input. This is necessary for distortion free demodulation). The gain experienced by the noise produced in the front end falls due to the decreasing IF gain - hence the signal to noise ratio improves. As the input signal continues to increase, there comes a point where all IF amplifier stages are driven fully into limit and hence there is no IF gain. Any noise now appearing in the output is due entirely to the FM detector and AF amplification stages. We can show the pattern of noise occuring in the output

graphically:



To summarize :
The performance at very low signal levels, i.e. at the onset of limiting is a function of the front end losses and the noise generated by the RF amplifier and mixer. Point A.

The performance on the limiting slope is a function of the IF amplifier chain. Point B.

The performance of the receiver under strong signal conditions, i.e. a fully limited IF strip is a function of the FM demodulator and any following amplifiers. Point C.

It is important that we specify parameters for all three states if we are to accurately define the TOTAL signal to noise performance of the receiver. The three parameters are defined by the tests used to measure them.

a. 12 dB SINAD.
b. 20 dB. quieting.
c. Ultimate signal to noise ratio.

(How to correctly measure these and other receiver parameters could be the subject of a future article).

IF SELECTIVITY requirements have been discussed in part 1. It was shown that it is necessary to have a filter sufficiently selective to prevent the unwanted pager frequency at 125 KHz spacing from the highest satellite frequency from reaching the demodulator. The discussion concluded that the lowest cost most practical solution was to place this filter in the second conversion stage. The first IF filter will only need to perform a "roofing function", but we still need to derive the required bandwidth for the second, more selective IF filter.

If we examine the signal transmitted by orbital weather satellites we find that the main RF carrier is modulated with a sub carrier of 2.4 KHz at a deviation of +/- 17 KHz. The video on the sub carrier has a highest frequency component of 1.6 KHz. This means that the modulated sub carrier has side bands of 2.4 KHz +/- 1.6 KHz, i.e frequencies between 800 Hz and 4000 Hz.

To obtain the filter bandwidth we need first to derive the modulation index (m) of the signal, where:

m = carrier deviation / highest modulating frequency.
Therefore, m = 17 KHz / 4 KHz
= 4.25

This value must be compared with pi/2. If greater than, it is defined as wide band FM (WBFM); if less than, narrow band FM (NBFM). The bandwidth formulae is modified accordingly. This is known as Carson's rule.

As 4.25 is greater than pi/2 we have WBFM.
So, band width = 2 (F max + d)
= 2 (4000 + 17000)
= 42 Khz.

The second consideration is that of Doppler shift. In this effect the received carrier is at a higher than channel frequency as the satellite approaches, moves down to be on channel at minimum distance and continues down below channel frequency as the satellite moves away.

Let us see how severe this effect is and hence how we can allow for it.

The linear velocity of the satellite varies as it passes from horizon through overhead to horizon. As we need to know the maximum shift of frequency we will only consider the horizon points.

Satellite speed (approx.)	= 28800 Km/Hr
	= 8000 m/sec
c (velocity of light)	= 300,000,000 m/sec (300.10E6)
Received freq. (typ.)	= 137,500,000 (1 + 8000/300.10E6)
	= 137,500,000 x 1.0002667
	= 137,53667 Mhz.
i.e. Doppler shift	= 137,53667 - 137,50000
	= 3.667 KHz
total shift	= 2 x 3.667 KHz
	= 7.334 KHz

If the Doppler effect is to be accommodated without frequency correction, then the IF bandwidth must be increased by this amount.

Total IF b/w so far	= 42 + 7.56 KHz
	= 49.56 KHz

The third factor to consider is the transmitted frequency tolerance and the receiver LO tolerance.

In practice a total band width of 50 KHz will be found to give an unrestricted receiver performance. It is, of course, important to ensure that the required signal to noise ratio is maintained.

INTERMODULATION PRODUCTS (IMPs) have been extensively examined in part 1. We can specify the maximum level of IMPs that we can allow to be generated, but we have to ensure that the receiver design will meet this figure. We have said that IMPs are caused by an amplifier (or mixer) having insufficient large signal handling capability, i.e. the stage is being overdriven. One very frequent cause of this problem is the indiscriminate use of a pre-amplifier. Modern receiver front ends are usually designed to

have a sensitivity of better than 0.2 uV (-121 dB) and a large signal handling capability just sufficient for the highest amplitude signal likely to be encountered in the application (unfortunately, this design criteria is not always met!)

The user, to gain more sensitivity makes the unwise decision to put a pre-amplifier ahead of the receiver.

The major effect of this is to ensure that now a large number of the signals received will overload the receiver front end and cause IMPs Reference to the earlier discussion on high selectivity filters will show the difficulty of providing a filter ahead of the pre-amplifier or between the pre-amplifier and the receiver with sufficient attenuation close to band to prevent additional IMPs.

Pre-amplifiers should only be used to compensate for excessive feeder losses. If the run is greater than 20 metres the system may benefit from a well tailored preamplifier.

Generally speaking, one stage ahead of an active mixer i.e. one having gain, is sufficient to give maximum performance, even for the lowest noise receiver. High gain rarely contributes any performance benefits and decreases the dynamic range of the receiver. N.B. For each dB of extra gain ahead of the mixer, the intermodulation distortion increases by 3 dB.

DYNAMIC RANGE is the range of signal levels that can be handled by any given signal processing system - in this case the receiver. The lower end of the dynamic range is defined by the noise floor of the receiver, i.e. an input signal level giving a signal to noise ratio of unity. At the upper end it is defined by the signal input level which produces 3rd order IMD products equal to the receiver noise level.

CROSS MODULATION is an amplitude distortion effect. It is related to the IMD and occurs when modulation from an unwanted signal is transferred to the wanted signal. The 3dB compression point describes the onset of cross modulation effects. It is independent of the wanted signal level and is proportional to the square of the unwanted signal level.

COMPRESSION is an apparent decrease of receiver gain - sometimes called desensitization. It is caused by a sufficiently strong adjacent signal driving the receiver front end into gain reduction. This is usually caused by exceeding the bias conditions on the RF amplifier.

SPURIOUS RESPONSE rejection is a measure of the receivers ability to ignore all unwanted signals not discussed so far. It can also include the image response discussed in Part 1.

AGC RANGE is a measure of the change in audio (detected) output for a level change of the incoming signal .

The above is not an exhaustive list but these parameters should appear on a receiver specification. Other parameters such as blocking, reciprocal mixing, IF leakage, etc. maybe considered. An evaluation of the above points should enable the derivation of a specification suitable for use as a robust VHF satellite receiver.

The following specification was met in the design and construction of my own receiver. I have tested it both in the laboratory and in the field in the immediate vicinity of pager base stations and other polluted RF areas and found unaffected satellite reception possible at all times.

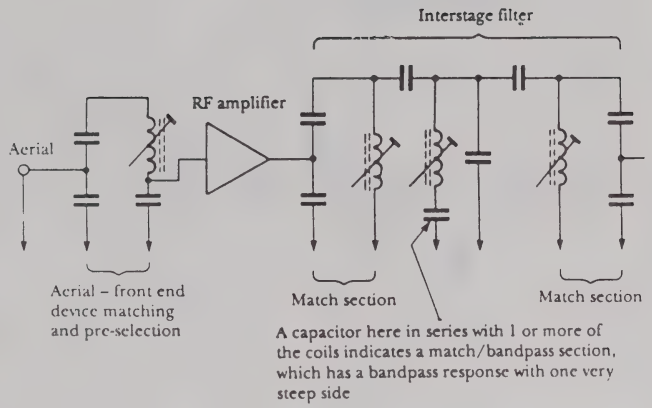
Specification

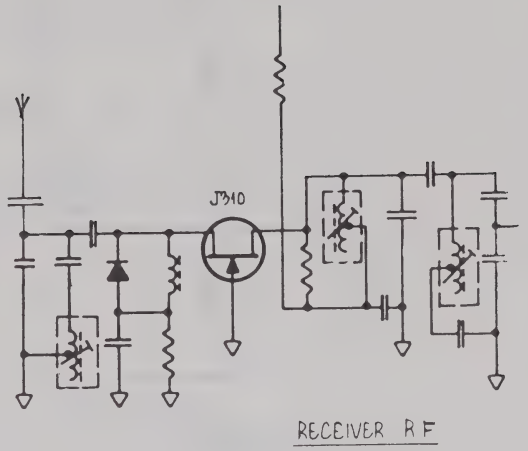
Frequency range	137 to 138 MHz
Frequency resolution	5 KHz steps
Frequency stability	+/- 2 ppm
Sensitivity 12 dB SINAD	-120 dBm (0.22 uV)
20 quieting	-116 dBm (0.35 uV)
ult. sig/noise	>45 dB
Intermediate frequencies	21.4 MHz and 455 KHz
IF bandwidth	50 KHz +/- 1 dB
	100 KHz +/- 60 dB
Selectivity (100 Khz off)	80 Db
Signal to ratio (RF: -107dBm, mod.= full)	35 dB
Intermod. response attenuation	75 dB
Dynamic range	110 dB
Spurious response attenuation	85 dB
Video output	1v pk-pk (600 ohms)
Video bandwidth	800 Hz - 4000 Hz
Operating temperature	-5 to +55 C

Realization

I have used various of the following circuit configurations in this and other similar applications and found them to be capable of meeting the above specification. The exact choice of circuit should only be made after a full gain and noise budget analysis has been evaluated for the specific task.

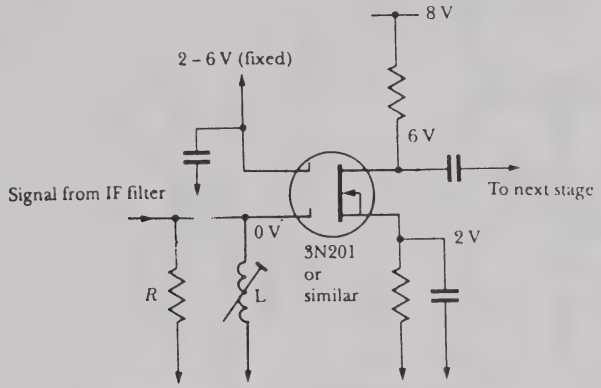
Local oscillator
BB105
J310
BC548B
1 n
V_{CC}
100 R
BF256
1 M
33p
V_{TUNE}
100 pF
3µ3
O/P


Interstage filter
RF amplifier
Aerial
Aerial – front end device matching and pre-selection
Match section
Match section
A capacitor here in series with 1 or more of the coils indicates a match/bandpass section, which has a bandpass response with one very steep side

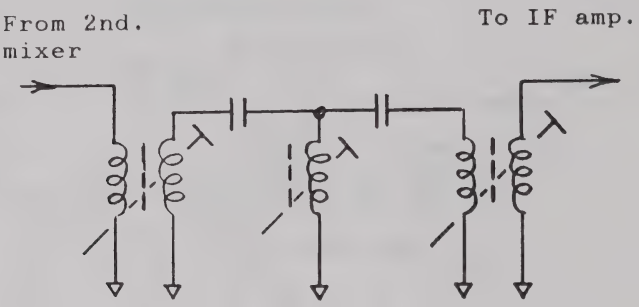

J310
RECEIVER RF

Preselect filter
Common base
In
3 V
2.3 V
7 V
Out
12 V
RF amplifier
Common gate
In
2.5 V
0 V
8 V
Out
12 V

Active mixers
12 V
IF out
2 V
2 x J310
or similar
1 V
12 V
0 V
0 V
RF in
LO in
Active balanced (FET)
+12 V
IF out
+8 V
2 V
J310
or similar
0 V
RF in
LO in
Active unbalanced
-15 V
IF
OSC
RF
-15 V
dual-gate MOSFET



First IF filter matching



High selectivity second IF filter

The rest of the circuit functions can be found in various of the IF amplifier/demodulator ICs available. N.B. It is important to check the second mixer (contained in the IC) has sufficient dynamic range for this application - many do not.

Summary

This concludes the second part of a two part article discussing the design requirements of a modern high performance weather satellite superhet receiver.

I hope the article has made clear that it is quite possible to design a receiver capable of giving excellent performance in spite of the adverse RF spectrum conditions in which we must operate. I hope also it has demonstrated that in order to achieve the desired specification the receiver must be considered as a total system and not designed piecemeal.

UPGRADES...

PC-SAT3 Upgrade disk. July 91, as mentioned in RIG24, including MET3-4. £3.00 handling charge, state disk size required.

PROSAT-II Upgrade disk, (DEC 91) including F10, F12, increased resolution on Russian Mets when saved as section, floppy disk fix. £3.00 handling charge, state disk size required.

SNOISE, Signal to noise measuring program for Meteosat (for ProsatII system only) Send disk and return S.A.E.

TIMESTEP HRPT DEMO DISK, 1.4MBt. £3.00 handling charge.

All available from the Chairman.

AUTOMATIC RECORDING OF WXSAT PICTURES

Viv Williams

Having for many years been an avid viewer of the weather pictures, primarily from the NOAA's but lately from the Russian satellites, I have never found the practise of recording the APT on tape very satisfactory. My main problem has always been finding time to playback the tapes once they were recorded.

Last year I upgraded my station to the RIG receiver and PCSAT3, from a BBC Master and the Martelec Framestore. Because of the interference generated by the BBC I always had to pre-record the APT before viewing. PCSAT3 with an IBM gave realtime viewing of the picture and far better definition as well. I could also now decode the Russia satellites. Suddenly, recording the APT on tape lost its attraction, and I decided to try to automate my receiving station. Late last year I upgraded to the Prosat II software. An upgrade which I have found very worthwhile.

With the advent of the Prosat II software I decided it was essential to automate my receiving station. The first part of the automation was to control the RIG receiver from my computer. Earlier designs in the RIG magazines all used multi-I/O lines, but because of the distance required between my computer and the receiver (10 metres) this was considered impractical. After consulting the circuit diagram of the Receiver, I concluded that I only needed two control lines. One to generate the pulses to clock the channels and the other to monitor the state of the squelch; one an input; the other an output. I wrote a very simple program that generated a pulse that was 1 second in duration, and whenever the squelch line indicated a signal it stopped pulsing. By counting the pulses, and resetting at the appropriate number, I could calculate the channel frequency. I now had control of the receiver via the computer.

It now became apparent that I would need to have two computers; one to control the Receiver and the other, an IBM, to display the pictures via ProsatII. Luckily I had a second machine, so I transferred control of the receiver to that one. In the meantime I had tidied up the software to provide a display of the Rx status and store a log of all Rx activity.

The problem was now to automate Prosat II. I had been using Desqview for running applications and knew that I could automate keystrokes by running script files. I tried manually starting Prosat II from Dos using an automatic script file in Desqview. It worked well, and I found that I had no memory

problems. I was now able to Download and save an image from the Dos prompt using Desqview to launch Prosat II. The aim of fully automated receiving station now started to become possiblility. However I had to over come the problem of modifying the Desqview scripts each time I ran ProsatII, to allow me to configure for different satellite types and to give each image a different file name.

This was achieved in a very simple way. I automatically created a Ascii file, before running prosat with Desqview, of the exact key-sequence required. I then ran Desqview and automatically loaded the program to convert the Ascii file to a desqview script file. Then I ran the desqview with the converted Ascii file as the start up file. I could now automatically set the configuration and save a unique file names for the image. The Ascii file was constructed from a simple C programme, although it could have been written in any language. I now had to send from the computer controlling the Rx information to the computer running Prosat II. This was done using the RS232 link. Protocol was simple. If the squelch was closed zeros were sent. If the squelch open the digit of the channel number was sent. I had my RIG Rx configured to scan 9 channels, so I would send a number between 1 to 9. This information was read by the Programme on the IBM and depending on the channel number various configurations of Prosat II could be set.

After some initial problems with getting the software to run correctly the system worked well. I could leave the system running and come back several hours later and find a number of pictures stored. There was however a major problem. This involved the way I had configured the script files for Desqview. Once a decode configuration had been set by Desqview for Prosat II it was not possible to interrupt it. After a certain time Desqview would save the image. There was no real time interrupt. This meant that I would store Blank images when the squelch bounced. This meant that I was still missing images. I had however proved I could get pictures stored automatically without using tape.

I now decided that I had two courses of action. I could try and further refine the Desqview approach, or try to find some method of interactively interrupting prosat. Initial I decided that the best approach was to continue with Desqview. However after much tweaking I decided that the interaction problem was a major flaw and I would have to try another approach. Being an avid reader of the computer magazines I had for several months seen programmes advertised allowing programmes to be run on a remote machine. This was just what I required except for that the fact that both

ends of the link needed to be running the same basic programme. This type of programme was also available as shareware/freeware. I obtained a copy of ELSEWARE, which incidently is freeware. Using this software I was able to control Prosat running on another computer with no problems.

I now had all the pieces I needed to automatically capture Polar orbiter pictures using Prosat. However I need to write some software and understand the protocol running between the two computers when elseware was running. So over the course of 6 weeks I investigated and documented the Elseware protocol and modified the computer controlling the receiver to send instructions in Elseware format to my IBM running Prosat. By now I was capturing approximately 60 pictures a day without any manual intervention. The only problem was that the hard disk space available was only 80 Megs. This lasted approximately 24 hours. So everyday I had to delete all the images. However I could view all the day's images in 20 minutes, which was the original idea. I only stored images from passes that were over 3 minutes in duration.

Just to recap; the system I use is as follows.

IBM with hard disk running Prosat II and Elseware connected to another computer via RS232 which controls the RIG Receiver. When the Rx squelch opens the first computer sends, via the RS232 link in ELSEWARE protocol, the set up procedures that would normally be typed on the keyboard. For example if the Rx identified a signal on 137.625, the character sequence to set Prosat to receive a NOAA image would be sent. If it was 137.850, a sequence to receive old style Meteor pictures would be sent. When the squelch closes, and if the duration is over 3 minutes, a character sequence is sent which saves the file with a unique file name.

I have now also coupled my Meteosat receiver in as well. So now if there are no Polar Orbiters in range I run VGASAT and view the Metosat pictures; and when a Polar orbiter comes in range I switch to Meganoaa to decode the Image.

If my system is of interest please do not hesitate to contact me.

11 Priory Green, Highworth, Swindon, Wilts.
0793 764651

I'VE GOT A LEAK

Gerald Srodzinski

My Meteosat picture went very snowy each time it rained and returned after the sun came out. I thought that I'd made a good job of the Dish connections and sealing the Converter. It took four days of no picture to spur me into action. My wife had noticed the withdrawal symptoms.

It was dull, but no rain about so, up with the ladder. Dustcoat pockets stuffed with tape, spray, spanners, hair-dryer and the "S" meter extended onto the roof.

No obvious signs where the rain could get in. The dish was a bit dusty. I knew that would not cause the trouble but I brushed it while I thought about the situation. The feed to the dish is a dipole with a scatter plate behind it and a split tube between the two for matching. Nothing wrong with that except that the silver plating was a little tarnished. I brushed away a cobweb. I had arrived at the dreaded point where I had to decide which part of the waterproofing to undo. It needed some thought - filled in the time dusting off the dipole and matching, out shot a spider from the split in the tube and the "S" meter came to life!

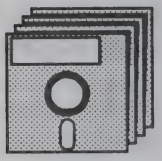
It would seem that the spider didn't like rain nor dull weather and only sunshine would bring him out. So, when "indoors" he mucked up the impedance match!

I've taped a clear plastic bag over the feed now!

ANSWERS TO WORD SEARCH

SATELLITE	SOFTWARE	KETTERING
METEOSAT	NOAA	PRIMARY
DECODER	KEPLER	SCANNER
ORBITS	DIPOLE	FRAME
IMAGING	ANTENNA	YAGI
SYNC	CIRCUIT	DISH
SQUELCH	OKEAN	

SHAREWARE CORNER...
By Mike Goodall



PCTRACK v2.1

This looks like a complete rewrite (except for the familiar menu screen layout) of the original v1.1. The start-up is much quicker and there is on-line help available. The text screen shows Long/Lat/Azim/Elev, etc. for one satellite, and you can fast forward. Graphics are improved, with Mercator projection (zoomable), in addition to close-up maps for Asian, Australasian, S.African, N.African, S.American, N.American, and of course European users. Now eight satellites can be viewed simultaneously, in Globe view (near or far), in World view with bulls-eye, or with Local maps. Ground-tracks can be disabled, continuous, or only when in range. The only problem with the program is that you still have to enter all the Kepler information in by hand (a non-feature long left behind by most other tracking programs). Due to its complexity, however, many users may still prefer the old version which is a lot quicker and easier to use. Available on DISK 99A.

EDSAT v.1.6

A useful program for manipulating NASA 2-line files. Includes Editing, Adding, Deleting, as well as Verification/Updating of Checksums. PD version. Available on DISK 99A.

ELEMENT MANAGER v.1.8

This is a complete kepler management program which works on 2-line files, but can convert from Amsat format, and save both formats. Allows editing of elements (checksum auto-updated), checking for duplicates, creating a new file containing a subset of elements, either by selecting satellite names, or using selection criteria (range of Mean Motion, inclination, etc.) Not PD, but free to copy. Available on DISK 99A.

IMAGE DISPLAY v.7.4

Reviewed by Richard Emerson in his PC Satellite System article, in this issue. Available on DISK 99A

Remember, shareware is not free. If you use it, please register it! This helps to promote updates from the authors; many of whom spend six months or more perfecting their programs. Another bonus is the User Manuals normally sent when you register, which contain a mine of useful information. In addition, the authors will normally try to sort out any problems that arise with their programs when used with your specific set-up.

MEMBER'S LETTERS

[Any letters sent to the Editor, Make-up Editor or Committee are assumed to be available for publishing in the Newsletter, unless otherwise specified.]

Dear Mike,

First of all thanks very much for the GIF library pictures - they are extremely impressive and something to aim for!! In particular, I was amazed at the pictures of the Shuttle, astronaut, and the Mars/Venus and Seasat images. Do you know if it is possible to get hold of any recent Shuttle mission images? *[Can anyone help...Mike].*

Peter Wade,
Sevenoaks, Kent.

We had a letter from Mr. C. Grant Dixon who uses a Spectrum, and wonder if there are any of you out there who have a Prediction program to run on this machine, which uses 2-Line or Amsat format Keplers. His address is: Kyrle's Cross, Peterstow, Ross-on Wye, HR9 6LD.

Dear Mike,

May I please take you up on your offer, made in the article, 'The GIF Picture Library'. As a beginner without my own receiving equipment, I think the picture library a very good idea.

R.A.Wallis,
Dorking, Surrey.

[I have had several letters in this vein, from members without receiving equipment, but hadn't thought of this aspect when the original idea was conceived...Mike]

Dear Mike,

Further to your comments and request for information from members in RIG27, enclose please find a print of the NOAA11 pass on 3rd Oct.1991,

covering North-West Africa to South Greenland, and of course the large low pressure area over Iceland. This is one of the very rare occasions that I managed to record an interference-free pass. *[If we can find a way we will try an reproduce this excellent picture in a future issue. Mike]*

My equipment consists of an Archimedes 440, Spacetech decoder podule and software, One of the original Timestep receivers, J-Beam X-dipoles antenna in the roof of the garage, Home-Brew resonant cavity, Hi-Fi Cassette tape recorder and a Canon Bj-10e bubble jet printer.

The resonant cavity is a variation of a design sent to me by Peter Hayes. Instead of a 12" long copper tube, etc., which is practically unobtainable in a short length, I tried an aluminium rectangular extrusion 110mm x 45mm x 220mm long, obtainable from Maplins, with double-sided fibre-glass PCB ends. It seems to work and get rid of the Pager Interference at the top end of the band, but not all the interference. Perhaps a more up-to-date receiver would filter out the other interference. Perhaps RIG could give some unbiased reviews in a future Newsletter.

A.J.Whitehead, Bath

Dear Mike,

It is my opinion that the RIG newsletter has drifted off into a highly eccentric orbit and has almost lost contact with the humble NOAA APT user.

I hope that I am not alone in possessing a very basic set-up which can only receive 137.5 and 137.65 MHz, i.e. NOAA polar orbiters. These satellites have been of enormous interest in the eight years I have been receiving them. Nowadays RIG seems to dismiss them as a starting point for newcomers who are expected to upgrade as rapidly as possible to state-of-the-art HRPT etc. Such hardware is sufficiently expensive as to induce heart-failure in a spouse or bank manager.

It is natural that we aspire to such heights as a group, but I am unable to go down that road. I am still working on how to improve and utilise the infra-red images, for example. I write software for a living and I am keen on the programming angle, but I find myself short of time to explore anything but the most simple problems.

I use the Weatherwatch announcement service for orbit references from time-to time, but they do not comment upon the operation of the satellites. In RIG 27 there were a couple of comments worthy of note for NOAA APT users, but the only other mention of NOAA operation during the past year was the announcement of NOAA 12. I am always interested in Les Currington's Soviet/Chinese Report, so how about a regular (or irregular) slot for the NOAA scene.

The following are observations of my own that are rather puzzling:

Why are there currently no less than three operable evening satellites and just one in the afternoon?

Why is the EQX of NOAA 11 becoming later by about 30 minutes per year, and similarly NOAA 10 earlier? If this continues we will have no daylight coverage at all !

Why does the signal from NOAA 11 seem weaker than it was ?

Is the very low contrast of 'visible' images from NOAA 11 simply due to low sun-angle at the moment ?

What determines the data channels in use on a particular satellite ? Do they change ?

What is the long-term future of the NOAA series, bearing in mind that NOAA 12 is effectively second_hand?

I am comparing the current output of NOAA 11 with good imagery from 1989 stored on audio tape and find the results very disappointing, even allowing for low sun and westerly drift. In winter it was always possible to distinguish the Mediterranean, and frequently fog and snow in Britain, at the moment I can barely see anything at all. I read the comment that a NOAA related article is forthcoming with enthusiasm, could the above be the germ of increased coverage ?

Finally, the recent increase in the number of technical, rather than review articles is refreshing. I am bored with people clicking mice, and I would listen to the Archers if I wanted agricultural stories. The COFF regulations should be stricter.

Jonathan Wilkins, Conwy, Gwynedd.

Dear Ed,

Having just received the latest RIG Newsletter and noting Mike's comments in respect of some pictures from South Africa and not knowing who may have promised some from South Africa I feel that it is incumbent upon me to give you some detail of my background and what I have been able to achieve to date in regard to weather pictures.

I have spent a large portion of my life on the central African plateau with an altitude of approx 4000' and being some 1000 miles from either the eastern or western coastline, hence the weather pattern which prevailed was very amenable, barometric changes were insignificant, the influence of frontal conditions were not felt and a two season climate prevailed. I.e. a wet season and a dry season.

Following upon my retirement to the Peninsular of the Cape Province in South Africa and being only 20 miles from the Cape of Good Hope, the climatic change experienced brought about a very deep interest in the prevailing weather patterns throughout the year and what better way to observe and monitor those changes than by means of APT visual resolution, hence the establishment of an SDUS to monitor and visually observe via METEOSAT the progression throughout the year of the frequent frontal conditions as they moved across the South Western Atlantic Ocean and from the Antarctic regions to make their influence felt upon our local weather patterns.

To achieve the foregoing, a 2 metre parabolic dish with associated mounting, together with feed horn and a monopole antenna was constructed. A Micro Wave Modules down convertor was mounted behind the dish and the 137.5 mHz output fed to a multi channel Timestep design Rx and thence to a typical YU3 UMV decoder and the resultant video output to a small modified black and white TV set.

At switch on there was consternation that no signal and no picture was being obtained, however once the antenna was correctly aligned to the right polarisation the first pictures were then being received with much jubilation. Now it was possible to monitor the weather pattern as it approached the Cape Peninsula and it was found that by switching to retain up to three consecutive days pictures of the local area on the screen at any one time. This was fine initially but it was obvious that a permanent record of the weather patterns was very desirable and to this end hard copy had to be produced.

Not having a PC or printer etc., it was decided to modify one of the older versions of the Siemens Hellifax machines to produce the relevant permanent record and this has proved to be very successful and a reasonable resolution is being obtained. A couple of typical reproductions are enclosed herewith and show what has been achieved. Certainly not comparable with the pictures which appear in RIG Newsletters but never the less they are very worthwhile.

Now of course sights are being set upon the acquisition of a suitable PC in order to obtain animation of my displays and ultimately to resolve (hopefully) HRPT from the NOAA series and to this end Dave Cawley's articles are of enormous interest.

In conclusion I wish to congratulate RIG upon their excellent Newsletters and the range of their content and I regret that I had not ventured into this all absorbing and interesting hobby earlier.

Should you wish to make use of any portions of this letter or the enclosed prints you are at liberty to do so.

Geo. H. Jillings (ZS1YZ/G3WMJ)
South Africa

Dear Editor,

First of all may I say that I find the recent surge of enthusiasm emanating from the revamped committee most encouraging. So much so that I just had to respond to your recent calls for more input from the rank and file members - so what follows is, I hope, what you have been looking for.

I first became interested in wx. sat. reception in the early eighties, when the only option appeared to be gaudy blocks of colour on a BBC micro's monitor. Although my father had a Beeb he had no interest in satellites and having just left school I could not afford the decoding equipment - so I drifted into other fields. Then one day in early 1989, whilst wandering around a local rally at the Norbreck Castle Hotel, I came across a stand with a monitor showing a wx. sat. image. Alongside were some booklets "An introduction to Weather Satellites" by M. Mansfield. I don't know who was on the stand. Was it a RIG committee member or just an enthusiast? I may never know. Anyway, I read the booklet and joined Rig.

By this time I had a BBC Master and the RX8 decoding package from Technical Software which I use for HF weather charts and with the APT1 module it was claimed I could download wx. sats. All I needed was a VHF receiver. After absorbing the wealth of information in the RIG newsletters I opted for a RIG scanning receiver. So after much acquainting one's self with the peculiarities of the RX8 system I had NOAA images on my dot matrix printer. My turnstile antenna gave me pictures from Sicily to Iceland. Sadly the image quality is poor, mostly due to the limitations of dot matrix printers and my tape recorder. But in Winter I get just a lot of wasted paper.

So at the present day I have a good receiver and antenna but no means of display. This brings me to my main point (I almost forgot I had one!) - Why have framestores been abandoned and why aren't there hundreds of redundant ones for sale? I have a horrible vision of remote imaging becoming like ham radio. Highly priced black boxes which take all the thrill out of the hobby. Commercial interests are in danger of killing off 'homebrew' interests with computer imaging gimmicks. I know PC's are here to stay but from the last RIG membership survey - nearly half your members still use the YU3UMV and very few receive HRPT.

It is good that RIG is supported by members in the forefront of development and I enjoy their accounts of their progress in more advanced areas. But it would be nice to see constructional articles on framestores etc. I would love to see a framestore like the YU3UMV but with all the add-ons integral in the design. As computers are still unable to produce hard copy images without great cost, fax and photographic fax machines must still be in demand. How do we go about adapting or constructing them? Most articles on such things appear in RIG newsletters in bits and bats. How about some at-length articles on the subject of hardware display systems?

It all adds up to the requirement of a good basic display system for the rank and file members who can't or just don't want to throw money at turn key systems and miss the thrill our predecessors had in the pioneering days. I see that RIG sponsor and market various products from the well known manufacturers. The Dartcom/RIG VHF receiver is a great example of what can be offered. Would it be viable for RIG to sponsor the development of a new custom designed framestore and sell at cost PCB's and component kits - as it did with the YU3UMV but somehow fizzled out. I hope what I've said has made some sense and if nothing else it's another opinion.

Paul Matley

Dear Mike,

In answer to your request for letters from members further afield I thought I might write to you about our activities "Downunder".

We have a small informal group here in Brisbane of 6 members. Of these 3 are operational on GMS-4 (1691MHz) and the rest on APT only. One is building an HRPT system based on Timestep equipment.

I have been operational on APT for about 4 years and on GMS-4 for 2 years. All the equipment is home brew, using a YU3MV framestore and a 386 PC clone with the local "SATFAX" software.

I have just heard GMS-4 come on for the 6 frames sequence, so I will close now. Best in weather watching.

Peter Williamson, VK4AWP, Australia.

Peter Williamson has also sent in details of SATFAX Version 5.0 and RADFAX2 produced and marketed by Michael Delahunty. We are happy to give a brief overview of the first system below, but hope that Peter might supply us with a full review article for our next issue, but in any case if you are interested in the programme you might like to contact the author direct at 42 Villiers Street, New Farm, QLD 4005. Australia. Telephone: (07) 3582785

'Satfax is a programme to receive NOAA's. METEOR, GMW & GOES weather satellite pictures on an IBM XT/AT & 386 or compatible computer with 640 Kb of memory. The programme supports both EGA and VGA cards and colour monitors as well as Trident, Paradise, Tseng Labs and other Super VGA modes. The pictures can be displayed or magnified on your screen in 16 or 64 colours, including a 16 or 64 greyscale. The pictures can be saved to a disk file for later retrieval or printed out on a 9 or 24 pin dot matrix printer, or laser printer. Pictures can also be recorded on a stereo audio cassette for later processing by SATFAX. Full documentation is provided.

Other features include 9 different reception speeds including 20, 60, 90, 120, & 240 LPM. 10 different user defined acquire modes - view and magnify modes with screen capture - animate or single step up to 100 screens - 3 aspect ratios to view in - improved directory and file handling - input translation table - create, load & save palettes - picture manipulation -

upside down - sideways - invert data - amplify intensity - colourise (single or multi-level) -Run command files - (can be started from DOS) to automate picture reception - sync on wefax or HF phase - re-align after picture reception - manual align at start of picture reception - test menu with signal level meter & external Timer frequency meter - uses any input port address.' Cost around 45 Australian dollars.

Dear Ed,

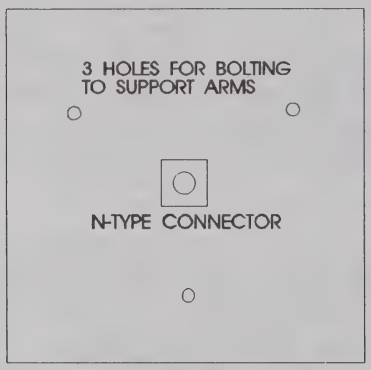
G'day from Down Under, I don't know why we are called 'down under' as since I have turned my world map upside down to get the true perspective of things, we are actually 'up over'. My name is Arthur Andrews or more commonly known as Andy, the JA's never could get their tongues round Arthur for some reason. I am a ham operator with the call sign of VK2 AAE. I am not normally active on 20 meters but if someone would like to arrange a sked I would be pleased to make contact. After working in Sydney since we made the big trip from the U.K. in 1967, my wife Hazel and I decided after our two kids had flown the coop, to go bush and we bought a small farm near the village of Wollar in central western N.S.W. where we run a herd of beef cattle. We are fairly isolated being 7 Km from the village which has a population of 60 and one service station cum general store cum everything. The nearest town is Mudgee which is 57 km down the road and where Hazel does her weekly shopping. The nearest pub is 30 km away, our local burnt down in 1953 and nobody has rebuilt it. However it has its advantages like perfect noise free amateur radio reception and more to the point perfect noise free satellite reception. Added to that we have lovely scenery and pollution free air, who would want to go back to the city. We get hot in the Summer, over 43C for three consecutive days last week, and quite cool in the Winter with frosts at night, but never any snow. We are at present in the middle of the worst drought since the 50's and the latest satellite pictures are scanned eagerly for any sign of rain bearing clouds. Normally January is our wettest month with an average rainfall of about 140mm, this year we have 7mm. Still, we are lucky as we have a 150 ft bore and a plentiful supply of lovely cool clear water. Well that's enough waffle about our domestic scene, what about satellites you ask.

I first became interested in weather satellites about 14 months ago and from very humble beginnings I have built up quite a good receiving station for both geostationary and polar orbiting weather satellites. As I began the learning process I found that very little was known about the subject here and although there was some equipment available most would have to be

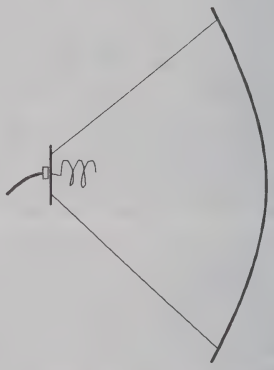
imported. After looking further into it and with the help of a government grant I went commercial, but that is another story. However to start with I had an old, slow XT PC and obtained some locally produced software and decoder board. I bought a Cirkit satellite receiver kit and in due course I received my first signals from an orbiting satellite. I was hooked, and this was the hobby for me. I further experimented with a Tandy 16 channel scanner and with some modification to the IF strip and RF realignment I found it was very suitable for weather satellite reception. However as I live in a non-polluted RF area I could not comment whether it would be any good in areas of strong adjacent VHF signals. I use two cross dipole antennas for comparison purposes, one fitted with a masthead amp, the other without. I am normally able to receive three useful passes from the polar orbiters. The first pass is between Australia and New Zealand and gives a good picture of the whole of the eastern coastline of Australia and the two islands of New Zealand. They tell me those islands are inhabited but I have not spotted any evidence of that yet. The second pass is over the centre of the continent and shows most of Queensland, N.S.W., Victoria, South Australia and the Northern Territory. The third is sometimes 'iffy' but usually you can see the West Australian coast and the Top End. I prefer the Russian Meteors to the NOAA's as Australia can easily be seen. I obtained some really good pictures of our recent tropical cyclone Betsy as she passed along the Queensland coast. If I can get these pictures in a GIF format I will send them over for the library.

Having gone commercial it was a good excuse to get a new computer so a 386 was purchased as well as a laser printer. Now I was ready for our next project, our geostationary satellite GMS. I purchased a Dartcom down convertor and a Sydney firm let me have a dish at cost for evaluation. The dish duly arrived and I was ready, or so I thought. When I ordered the down convertor I had not thought to order the feedhorn as well so there sat the dish like a gigantic 1.8 metre Wok and as about much use. To order a feedhorn from RIG and then wait for the next convict ship or tea clipper to deliver it to Sydney and then by bullock train to Wollar was just going to take too long. After trying several jam and other containers for the required dimensions I gave up. One would think that manufacturers would take into account the needs of satellite watchers. I then decided to attack the problem from another angle and build a helix antenna fitted at the focal point. This proved to be surprisingly simple yet very effective and I have enclosed a plan for anyone who is interested. I cut a 17cm square out of a sheet of 1mm aluminium sheet for the ground plane, in the centre I drilled a hole large enough to fit an 'N' type socket. I also drilled three holes for the horn support arms which were supplied with the dish. At the rear of the

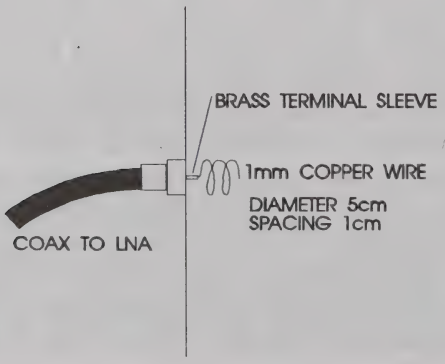
socket I soldered in a small piece of copper wire into the centre conductor to give it strength. I then put a small brass sleeve taken from a 240 volt terminal joiner and screwed it into the centre conductor of the socket. I was then able to experiment with different sizes of helix by inserting them into the other end of the brass sleeve and tightening the screw. This enabled quick changes to be made. having done my sums I found that I needed a helix with a diameter of 5cm with a 1cm spacing between turns. I used 1mm soft copper wire which was ideal for the job. I tried from one to six turns to get the best s/n ratio. I discovered that a can of beer had exactly the right dimensions for winding the helix on, though Hazel didn't quite understand why I had to use a new can of beer, I had to drink the contents of course to prevent wastage, every time I wanted to wind another helix. I finally found that a three turn helix gave the best result and I am receiving noise free pictures from GMS. The whole helix would have cost no more than $4.00 to make.

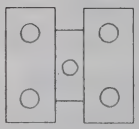


1mm SHEET ALUMINIUM 17cm SQUARE



HELIX SET AT FOCAL POINT





BRASS SLEEVE AND SCREWS TAKEN
FROM TERMINAL CONNECTOR BLOCK

Getting the satellite was not as easy as building the helix because of two things I had not checked on. After days of receiving not a whisper of a signal despite trying all the designs I could think of I was ready to take the dish up the back paddock and use it for target practice with my Winchester .3030. As a last resort I decided to check the alignment again. I checked and then checked again, my elevation was out seven degrees. How that happened I do not know and can only put it down to the fact that a couple of friends and I had put it up on New Year's day and maybe our readings were slightly hazy. Having adjusted the dish I continued trying out antennas but still with no luck until about 4 p.m. one afternoon I heard a faint signal for the first time. Great excitement and I went indoors to get the rest of the experimental helix. I unplugged the one in use and fitted another. No sound, I put back the original, no sound. Thoroughly disgusted I sat on the verandah and contemplated the dish. At about 5 p.m. I heard another signal and then it dawned on me. It did not transmit all the time. On the first and second hour the transmissions are of Japan and surrounds, and consist of one IR and one VIS picture, at night there are two IR pictures. I suppose we can't complain as it is a Japanese satellite and if we complained too much they might take their ball home and not let us play with it. On the third hour besides receiving the two mandatory pictures of Japan it sends out a set of four pictures comprising of the Northern Hemisphere West and East quadrants and then the Southern Hemisphere West and East quadrants and in the latter two Australia can be seen in all her glory.

To further confuse the issue they for some reason use a 250kHz bandwidth effectively making any receiver suitable for receiving the other geosats perfectly useless. Luckily my son was visiting for the New Year and he had an ICOM R100 scanner with him which he had bought on one of his first trips abroad. We hooked this up and used the wideband FM setting and the results were first class. He has just gone over to Indonesia for a three year tour with his work so dad has taken the scanner into protective custody. I hope to source a cheaper solution to the problem soon.

One advantage of having your hobby as a business is that you can justify to your XYL that you have got to have all the latest hardware and software for R & D and evaluation purposes. There is certainly a lot about especially in the States and it is interesting to compare the various things available so that I can select the best available to market over here. If anyone has any questions about Australia generally please drop me a line and I will endeavour to answer them.

Arthur Andrews (VK2 AAE)

Dear Ed,

A letter of thanks.

I have been a member of RIG for about a year now and I must say how much I enjoy the newsletters containing as they do a wealth of information upon practically all aspects of weather satellite observation. I particularly enjoy the equipment reviews and circuits that appear from time to time.

My early days were concerned with building Maplin equipment to use in conjunction with an Amstrad 6128 CPM computer. I never did manage to get good results and have since progressed to using PCSAT-3 and PROSAT-2 together with AT286 and AT386 computers.

Being a complete novice to the hobby and not having had any previous experience with the use of PC's, I have of course came upon quite a few snags during the past 12 months. It has been a very pleasant discovery to find out how friendly and helpful people have been to me during that time. I would like to mention in particular Lawrence Harris and his son Tim who at one time went so far as to write a software programme for my early Maplin/Amstrad set up. I suppose that it was reading about weather satellites in his Info-in-Orbit articles in Short Wave Magazine that got me hooked in the first place and my subsequent joining RIG. As I mentioned earlier I am now using Timestep equipment and I must say that the help and support that I have received from Dave Cawley has been outstanding.

Joining RIG was one of the best things I did, and in my humble opinion absolutely essential if one wishes to keep up to date with all the news and views. A recent facility offered by RIG is Mike Goodall's GIF library - a good opportunity to see images from other parts of the world, thanks Mike.

My best wishes and many thanks to all the team,

Brian Dudman, Harrow, Middlesex

Remember...All Reader's Letters direct to James Brown, Please.

THE NEALE'S GUIDE TO SECOND-HAND WEATHER SAT EQUIPMENT

This guide is intended as a reference to expected second-hand equipment prices when sold between members and at rallies, etc. It can only be approximate, due to age and varying condition of equipment.

FRAMESTORES (YU3 TYPE)
SINGLE PAGE, uncased £150.00, cased £200.00 upwards
FOUR PAGE, uncased £200.00, cased £240.00 upwards

PCSAT3 SYSTEM (Members Price, New £141.00 incl. P&P)
In good cond. £100.00 upwards

PROSAT II (Members price, New £253.00 incl. P&P)
Clean £175.00 - £200.00

OMNIFAX (New price £201.19 inc. P&P)
In good cond. £140.00 upwards

AMIGASAT PACKAGE (New price £165.41 incl. P&P)
In good cond. £110.00 upwards

DARTCOM (RIG) DOWNCONVERTER (New price in box £183.00)
In good cond., no corrosion £120.00 upwards

MICROWAVE MODULES DOWNCONVERTERS
Working cond. £40.00 average

DARTCOM SCANNING RX, LCD DISPLAY (New price, unboxed £169.00)
Smartly boxed £180.00 upwards
AS ABOVE, BUT LED CHANNEL READOUT (New price, unboxed £128.00)
Smartly boxed £140.00 upwards

CIRCUIT VHF RX (New price, around £40.00)
Boxed, working, £30.00 approx.

DISHES (New price with mounts and feed £70.00 - £75.00)
Clean cond. £30.00 upwards, depending on cond. size, feeds, mounts, etc.

This has only been an attempt at producing a guide. Perhaps you could advise James of actual deals and if you agree with our prices.

RIG AT RALLIES...

Below is a list of rallies attended by RIG last year. We hope to see you again at these events this year, but if you are in doubt over any event, please give the Chairman a phone call.

March 7-8	Pickets Lock
March 14	VHF Convention - Sandown
May 3	BATC - Harlaxton Manor
June 14	Elvaston Castle
June 28	Longleat
July 5	York
August 2	Woburn Abbey
September 13	BARTG - Sandown
September 20	Peterborough
October	Leicester

We are always pleased to see volunteer members at these events, especially those who live local to the event, who can help on the stands, and give the regulars a small break during the day.

A quarterly publication for hardware, software and applications of WEFAX, APT, VAS, HRPT and GOESTAP.

WeatherSat Ink

The Environmental
Satellite Applications Journal

4821 Jessie Drive, Apex, NC 27502, USA

$15 US per year $20 all others, US funds
MasterCard/Visa OK with $1 surcharge

RIG HELPLINES:

General Enquiries Meteosat information NOAA information Supplier Complaints	John Tellick	081 390 3315

A copy of the Group Rules can also be obtained from John Tellick

Russian, Chinese satellite information/status	Les Currington	0707 326058

Schools Education Co-ordinator		John Tellick	081 390 3315
Schools/ Educational Enquiries	John Murray	Torquay	0803 217490
	Frank Bell	Godalming	0483 416897
	Tom Walter	Reading	0734 871330
	Bob Coombes	Haslemere	0428 642930
	John Din	Bristol	0454 773387

Framestore Technical Support	Mike Coombs (7.30pm-9.30pm)	0530 243494

RIG MICRO SPECIALISTS:

PC and Compatibles	Dave Cawley (after 6.30pm)	0440 820040
BBC Micro	Enquire via John Tellick	081 390 3315
Commodore Amiga	James Brown	0656 782632
Atari ST, Archimedes	Peter Newman	0487 812121
PCSAT3 and PROSATII	James Brown	0656 782632
HRPT and Primary Data	Dave Cawley	0440 820040

RIG SHOP CORNER

Meteosat Downconvertor:-
a) Assembled and tested module in tin plate box:- ... £147.00
b) Complete mounted in weather proof box:- £183.00
Waterproof power and channel change connector £10.00 extra if required, but note these functions can all be done via the coaxial downlead.

RIG VHF Scanning Receiver
a) Basic receiver module, with LED Channel number display, fully assembled and tested £128.00
b) Same module as above but with liquid crystal frequency display module replacing the LED Channel display £169.00

The **RIG VHF preamp** also available includes a bandpass filter and is ideal for mast-head mounting. It is available from the Chairman as a built and aligned PCB measuring 85mm by 33mm (3 5/16 x 1 15/16 inches). Module including first class post £16.00

28 page booklet entitled: Introduction to Weather Satellites & their Reception by Mike Mansfield £2.50

Low noise Amplifier Kit
All enquiries regarding availability, etc. to the Chairman ... £28.00
David Juett YU3 i/f s/w for IBM PC & clones £6.50
Dishes, 1.6 metre £48.00
Dishes, complete with Feed horn and mount, plus Dish mount to 2" pole, inclusive in price, Nearly new cond. 90cm active area ... £70.00
ditto 100cm active area ... £75.00
For delivery service on RIG dishes, see "From the Treasurer" page 9.

We now have a supply of low price new/used N-Type and SMA to fit UT141 rigid coax. Ring Henry for details.

ALL ITEMS ABOVE ARE AVAILABLE FROM THE CHAIRMAN

All cheques payable to "Remote Imaging Group" please

(Overseas Members ordering goods; Please pay in Sterling by cheque or draft on a bank with a London branch.)

Rig Binders
Available by post from Gordon Fleming, 168 Bythway, Welwyn Garden City, Herts. AL8 1DU. Price £4.00 each, including P&P.
All Cheques payable to "Remote Imaging Group" please

RIG - Timestep PCSAT III

A small half sized PC card that will allow the display on IBM PC type computers of APT signals from Meteosat, GOES, NOAA and the Soviet polar Meteor and Okean satellites.

Card type	Half card 8 bit, plate through solder resisted
RFI	FCC part 15 and 1992 EMC compatible
Input	Two separate inputs, 100mV 10K ohm audio (adjustable)
Source	Live or from tape (no sync track needed)
Synchronisation	Derived from subcarrier on Meteosat, GOES and NOAA. From digital signal processing (DSP) on Meteor and Okean. No computer timing or calibrations used (or needed).
Resolution stored on disk	600 pixels 800 lines and 256 intensity levels
Zoom	To pixel resolution regardless of video card
Acquisition	Fully automatic on Meteosat and GOES (any PC). Fully automatic NOAA, Meteor and Okean live or tape (VGA, 286 and above only)
Printing	High resolution HP LaserJet (and clone) driver
Power	Supplied from host computer
Colour	64 greys or 256 colours from colour routine supplied
Contrast	Stretch or compression in linear or non linear
Display resolution	800 x 600 256 colours VGA
	640 x 480 256 or 16 colours VGA
	640 x 400 256 colours VGA (Paradise, Amstrad and Atari)
	320 x 200 256 colours VGA (display only, receive in 640x480x16 mode first)
	640 x 350 16 colours EGA (not NOAA or Soviet)
	320 x 200 4 colours CGA (not NOAA or Soviet)
	640 x 200 16 greys Amstrad 1512 (not NOAA or Soviet)
Cards supported	Any IBM register compatible card
	Tseng Labs chip set (Orchid, Sota etc)
	Paradise (Amstrad, Atari, Viglen etc)
	Video 7
	Trident (legal versions only) (Morse, ZyMOS)
Animation	Flicker free. Any section or zoom, 400 x 300 x 7 (VGA EGA)
Contents	Manual, PC card, software
Input connector	9 way D socket
Price	£137.50 (rally price) plus £3.50 postage and packing

Available from Henry Neale
Thornlea Fishersgate Sutton St James
Spalding Lincs Tel. 0945 85353

RIG Timestep PROsat II

The PROsat II Weather Satellite system is for those users with a good PC. The system will outperform most Apple MAC II and other systems up to £25,000.00 with ease !

The system receives Meteosat, NOAA, GOES, GMS, Meteor synchronous, Meteor assynchronous, Okean synchronous and Okean assynchronous, also Feng Yun when available. High quality images are displayed in 1024 x 768 pixel resolution with 64 grey levels or 256 colours.
1024 x 768 in 256 greys is available for the Hercules Graphics Workstation Card !

Animation is available from Meteosat. This stunning facility is best shown when watching storms develop and move across the Earths surface. Up to 100 images can be automatically animated. More importantly, unlike other systems it shows the last 100 frames continuously, you don't have to ask it to show you, it's on the screen all the time. Also, unlike other systems when all 100 frames have been received it doesn't just stop, it carries on and replaces the earliest frame with the latest one. In other words every time you pass by the PROsat you will see the last 100 frames.

Meteosat Animation

Full screen animation of 100 frames

Zoom mode in animation

User definable grey scale

NOAA Meteor Okean Feng Yun Polar Option

Live display of incoming images

Saves COMPLETE pass in full resolution (2.4MB file)

3D and image processing

Temperature readout with no calibration needed

Automatic Latitude and Longitude Griding

Your location shown on image

Temperature slice for ice floe studies

Meteosat still frame

Laser dump built in

Live display of incoming images

Auto Schedule for saving in your absence

Zoom and Pan to greater than pixel level

3 D display option

Histogram equalisation for best contrast

Smoothing filter

Edge enhancement filter

Median filter to remove annoying country outlines

Transect from ANY two points

False colour with autoshade

General

This new card with gold plating has built in relay switching for two receivers. It is fully mouse driven with easy intuitive pull down windows. It will run with the new Tseng ET4000 and Trident 8900 cards in 1024 x 768 x 256 in all modes (except animation). This feature allows maximum resolution in real time.

It will only work with a 286 or better PC with VGA and a properly formatted hard drive.
Super VGA and a mouse are required for some facilities.

See James Brown's review in RIG 26 for an impartial users impression.

The Retail price is £499.99 but can be bought from Henry Neale for only £250.00 plus £3.00 post and packing. You can upgrade your PCSAT III if you return the original unmodified card and discs directly to timestep for £120.00 inc. You must be a RIG member to qualify for these prices.

Henry Neale
Thornlea Fishers Gate Sutton St James
Spalding Lincs. Tel. 0945 85353

PROLOGUE COMPUTERS LTD

2 ORCHARD RISE, OLVESTON, BRISTOL
BS12 3DY. TEL. 0454 612882/325430

□ COMPUTERS

Professional quality systems at discount prices. Ideally suited for use with the RIG - Timestep Interface/Software, at display resolutions up to 1024 x 768 Pixels With Super VGA monitor.

368sx 20MHz 1Mb RAM (expandable to 8Mb) Teac 1.2 or 1.44Mb Floppy drive.
Small footprint high quality metal case, 200W PSU. 4 Free Expansion slots.
14" SVGA Colour monitor Tseng Labs ET4000 (1024x768x256) VGA Card.
40Mb Hard Disk, Latest AMI BIOS. £847.00

386 DX-33MHz. 32Kb Cache, 2Mb RAM (expandable to 8Mb). Teac 1.2/1.44Mb drive.
Small footprint high quality metal case, 200W PSU. 4 Free expansion slots.
14" SVGA Colour monitor Tseng Labs ET4000 (1024x768x256) VGA Card.
40Mb Hard Disk,Latest AMI BIOS. £1056.00

486 -33MHz. 64Kb Cache, 2Mb RAM (expandable to 32Mb). Teac 1.2/1.44Mb drive.
Small footprint or full AT case, 200W PSU. 3/5 Free expansion slots.
14" SVGA colour monitor Tseng Labs ET4000 (1024x768x256) VGA Card.
40Mb Hard Disk,Latest AMI BIOS. £1277.00

□ OPTIONS:

VGA Mono monitor 14" (640 x 480).....Less £168.75
Memory Upgrade per Mb.....ADD £35
1 Yr On Site Maintenance (By Service Data Ltd)..ADD £70
Mini Tower Case (Leaves 5 free expansion slots) ADD £10
89Mb 15ms Hard Drive..... ADD £130
Serial Mouse.....ADD.£20
MS DOS v3.3.....ADD £23
MS DOS V5.0.....ADD £49

□ COMPONENTS:

MOTHERBOARDS : XT-12 £56, 286-12 £63, 386SX-20 £199, 386-33 £299.
VGA CARDS : Paradise 256kb (640x480x16 colours, upgradable to 512kb) £70.00
Paradise 512kb (640x480x256 colour etc.) £85.00
Tseng Labs 1Mb (1024x768x256 colours, etc) £102.50
MONITORS : 14" VGA Mono £85, 14" VGA colour £199
14" Super VGA colour £215, 14" Multiscan Colour £265
FLOPPY DRIVES : TEAC 360/720Kb £48, 1.2/1.44Mb £51
HARD DISKS : SEAGATE ST251-1 40mb 28ms £175, 42Mb IDE 25ms £128.

Please call for further information on systems and components (Day/Evening)
All prices EXCLUDE VAT. Delivery - 5 Days (Components), 10 Days (Computers).

AMIGASAT 2.0

For Amiga owners this highly acclaimed package offers superb all-round performance in decoding and displaying weather satellite images.

This is what Amiga Shopper magazine had to say:

"Excellent program which takes full advantage of the Amiga's possibilities"

"If you want to get into satellite reception, this is the way to go"

"By way of conclusion, Amigasat is an excellent program. The program makes capturing images easy, and furthermore, it provides plenty of tools for tweaking the images to remove noise and transmission errors, as well as enhancing obscure details."

" ...it is worth every penny"

STOP PRESS - Another excellent review of Amigasat has just been published in *Amiga User International* magazine. Copies of this and the above *Amiga Shopper* review available on request (please send A5 stamped, addressed envelope.)

- Decodes NOAA, Meteosat, Okean, Meteor, including the Meteosat digital header
- Decoded and stored in full 8-bit resolution
- Extensive use of software DSP techniques throughout, including high performance demodulation performed entirely in software.
- Full support for multiple images, inter-image processing on part or full images, including maths functions, image addition, subtraction, and multiplication.
- Images completely compatible with other Amiga IFF processing packages.
- Displays image to full Amiga resolution (640 x 512 x 16)
- Fixed and user-defined zoom to any resolution.

Software & Interface Package

£139.50 (excl. p&p and VAT)

martelec *communication systems*

The Acorns, Wyck Lane, East Worldham, Alton, Hampshire GU34 3AW, U.K. Tel/Fax 0420 82752

OMNIFAX 4.0

Facsimile or Weather Sat?

Both! In one package, Omnifax gives you the software and interface card for both facsimile and wxsat reception. This latest version of Omnifax has even more features and improvements and represents superb value - especially if your interests span both weather satellite and facsimile recption. The package contains a comprehensive interface card for the demodulation of ***all*** satellite and facsimile modes. In addition, the interface contains all the necessary hardware for the optional SSTV and CW/RTTY/ASCII packages.

Separate inputs are provided for fax and wxsat, enabling the permanent connection to their respective receivers. Omnifax runs on any AT machine (286, 386, 486) and some faster XTs (10MHz and faster)

Facsimile Reception

Probably the most comprehensive system ever offered for the reception of facsimile transmissions - decoding all standards found on VLF, through to UHF, including amateur fax, press fax (incl. colour), meteorological charts etc. The package provides automatic scrolling, and caters for IOCs of 144, 264, 267, 353, and 576 and drum speeds of 60, 90, 120, 180, and 240rpm. There is software shift selection to allow for 1900+400Hz or 1900+150Hz signals. The drumspeed reference is quartz stabilized for accurate and stable image framing, and the images may be scanned in any of four directions.

Weather Satellite Imaging

Decodes Meteosat, NOAA, Meteor, Okean, Cosmos etc. with all sync tones detected. IMages are displayed in either EGA, VGA, or SVGA formats with excellent clarity and definition. Images are decoded and stored in full 8-bit resolution. The system features fully automatic reception capability, programmable timer, multi-sequence animation, and superb printer dumps for laser and dot matrix printers.

Price £169.36

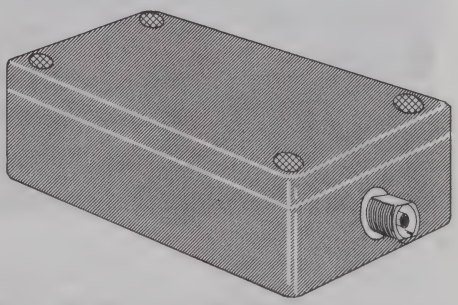
(Price excludes carriage at £4, and VAT)

MSC30
LOW NOISE DOWNCONVERTER

We believe our new MSC30 Downconverter is quite simply the best you can buy. This completely new design uses the ultra-low noise 32184A HEMT front-end, and GaAsFET mixer to achieve state-of-the-art performance. The new model is now offered either in a tinplate box or enclosed in a hermetically sealed diecast metal box for outdoor use.

Features:

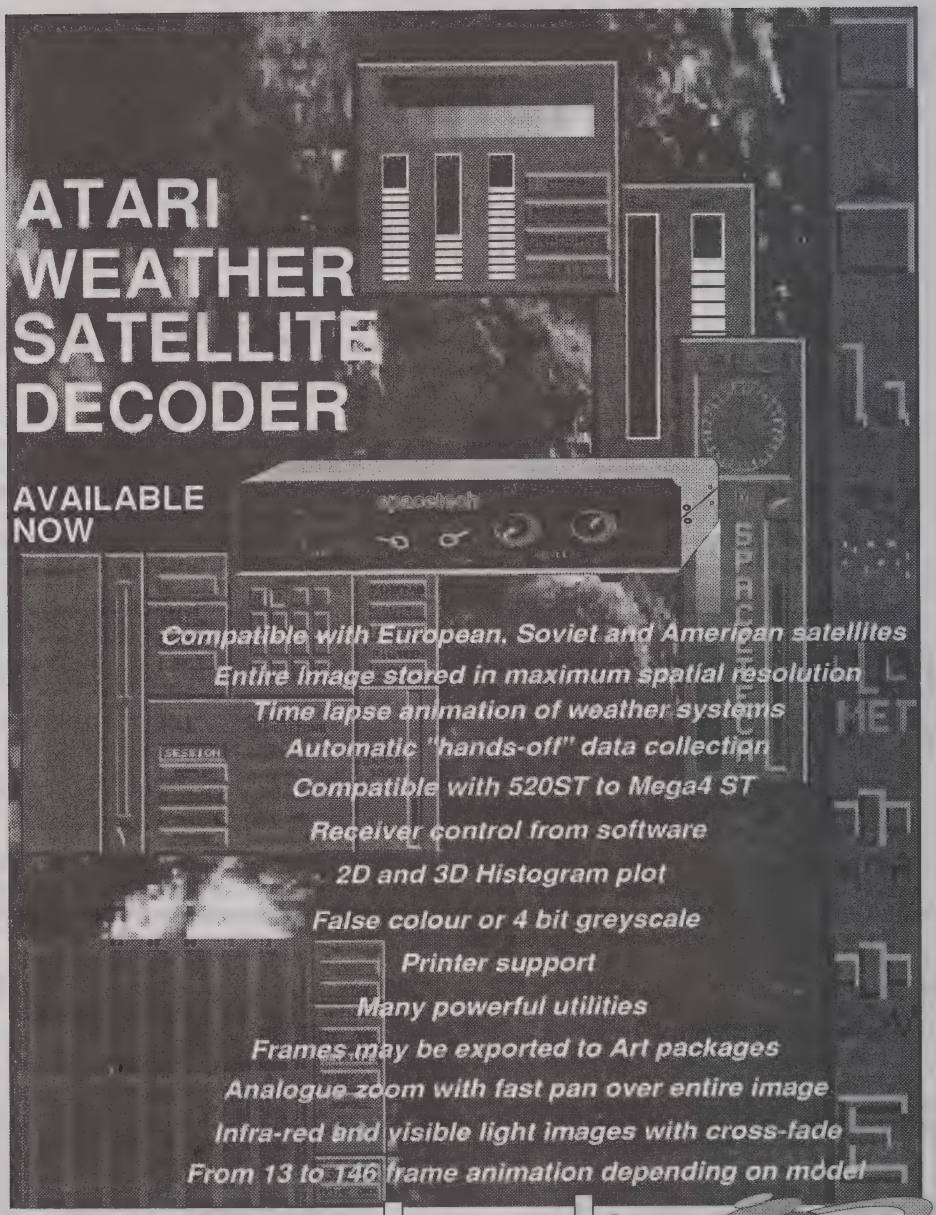
- *Low noise HEMT front end - 0.7dB typ.*
- *High output drive level for long cables (Gain 55dB typ.)*
- *Precision crystals with temperature control*
- *Can now be powered either via signal coax or separate lead.*
- *Complete with all connectors and dish cable. (Cased version)*



Prices
In Weather-proof Box £160
In Tinplate Box£135

martelec *communication systems*

The Acorns, Wyck Lane, East Worldham, Alton, Hampshire GU34 3AW, U.K. Tel/Fax 0420 82752


ATARI
WEATHER
SATELLITE
DECODER
AVAILABLE
NOW
Compatible with European, Soviet and American satellites
Entire image stored in maximum spatial resolution
Time lapse animation of weather systems
Automatic "hands-off" data collection
Compatible with 520ST to Mega4 ST
Receiver control from software
2D and 3D Histogram plot
False colour or 4 bit greyscale
Printer support
Many powerful utilities
Frames may be exported to Art packages
Analogue zoom with fast pan over entire image
Infra-red and visible light images with cross-fade
From 13 to 146 frame animation depending on model
spacetech
space science resources

21 West Wools, Portland, Dorset DT5 2EA. U.K. Tel. 0305 822753 Fax. 0305 860483

PC or ANY other system ? Part III

Feature	PC	ANY other system
Screen resolution	1024 x 768 x 256	
Grey levels displayed	64 grey and 256 colours	
Grey levels stored	256	
Animation	up to 100 frames	
Save image in full resolution for later use	YES	
Printer facility using laser printers	YES	
NOAA and ALL Polar satellites	YES	
Meteosat and ALL Geostationary	YES	
NOAA HRPT option	YES available now	
Meteosat PDUS Primary Data	YES available now	
Cost to upgrade per 1 Megabyte	£29.00	
Cost to upgrade to 40 Megabyte hard disk	£135.00	
Runs industry standard software	YES	
RIG PCSAT III Software included	YES	
Total cost INCLUDING PCSAT III software	£599.00	
Completely built including mains plug	YES	

We firmly believe that the PC is the best solution for Weather Satellite use. The on screen resolution of 1024 pixels, 768 lines and 256 colours is superb. The ability to add memory at just £29.00 per megabyte is incredible. The 40 Megabyte hard drive at £135.00 is amazing. HRPT and Meteosat Primary data will work on the PC AND we can demonstrate this NOW !

Why don't you look carefully at other systems, add ALL the costs and see how they compare. Fill in the details on this page. Check carefully that the new Soviet Meteors and Okeans are fully covered. Check that you can see HRPT and Primary Data working NOW, we all know what "we are working on it" means. Check that everything is in stock. Check on the availability and price of upgrades. Ask other users and RIG members. Then and only then decide what your future in weather satellites is going to be !

What do you get ? A 386 16Mhz computer in a real metal case with a 200W full spec power supply. 2 serial ports and 1 parallel port. A full AT keyboard. 1Mb of RAM. A 1.44 or 1.2Mb drive. A 1024 x 768 x 256 colour ET4000 video card. MS-DOS 5.0. RIG PCSAT III card and all software. In fact a fully featured 386 computer and RIG PCSAT III ready to go. The 386SX motherboard will **DIRECTLY address up to 16Mb** of cheap on board memory.

1024 x 768 x 256 shop soiled 0.28mm pitch colour monitors £129.00 carriage £10.00

1024 x 768 x 256 ET4000 1Mb video cards £99.00 carriage £5.00

In line with our competitors, the prices in this advertisement do not include VAT at 17.5%

Timestep
Wickhambrook Newmarket CB8 8QA England
Tel. 0440 820040 Fax. 0440 820281

TIMESTEP

HRPT System

Noise-free digital HRPT transmissions from NOAA, with a ground resolution of just 1.1km, allow images to be received in incredible clarity. Rivers, lakes, mountains, cities and even small towns can be seen on good days. Fishermen will appreciate the increased resolution of sea surface temperatures.

Image processing, including variable and histogram contrast equalisation combined with full colour editing, gives the best possible results from any image. Colour enhancement allows sea surface temperature and land details to stand out in high contrast. Any number of colour palettes can be saved for future use. The sophisticated mouse-driven software allows all five bands to be saved and displayed on nearly all VGA and SVGA cards right up to 1024 pixels, 768 lines and 256 colours.

Zoom to greater than pixel level is available from both a mouse-driven zoom box or using a roaming zoom that allows real time dynamic panning.

Sections of the image may be saved and converted to GIF images for easy exchange.

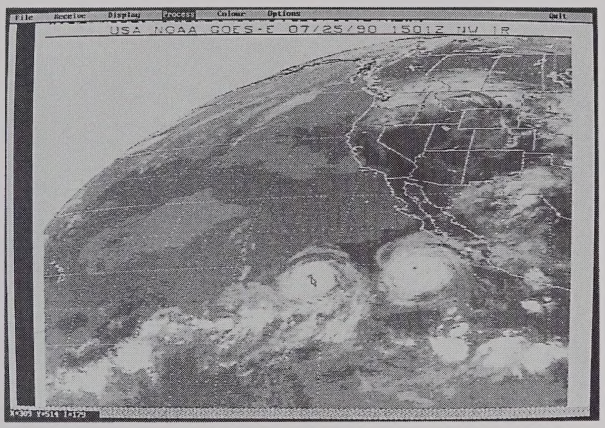
Latitude and longitude gridding combined with a mouse pointer readout of temperature will be available late in 1991.

Tracking the satellite is easy and fun! Manual tracking is very simple as the pass is about 15 minutes long. A tracking system is under development and expected by the end of 1991. A 4-foot dish and good pre-amplifier are recommended. The Timestep Receiver is self-contained in an external case and features multi-channel operation and a moving-coil S meter for precise signal strength measurement and tracking. The data card is a Timestep design made under licence from John DuBois and Ed Murashie.

Complete systems are available, call or write for a colour brochure.

USA Amateur Dealer. Spectrum International, P.O. Box 1084, Concord, Massachusetts 01742. Tel: 508 263 2145

TIMESTEP WEATHER SYSTEMS
Wickhambrook Newmarket CB8 8QA England Tel: (0440) 820040 Fax: (0440) 820281



VGASAT IV & MegaNOAA APT Systems

1024 x 768 x 256 Resolution and 3D

The Timestep Satellite System can receive images from Meteosat, GOES, GMS, NOAA, Meteor, Okean and Feng Yun. Using an IBM PC-compatible computer enables the display of up to 1024 pixels, 768 lines and 256 simultaneous colours or grey shades depending on the graphic card fitted. We actively support nearly all known VGA and SVGA cards. Extensive image processing includes realistic 3D projection.

100 Frame Automatic Animation

Animation of up to 100 full screen frames from GOES and Meteosat is built in. We call this 'stand alone animation' as it automatically receives images, stores them and continuously displays them. Old images are automatically deleted and updated with new images. The smooth animated images are completely flicker-free. Once set in operation with a single mouse click, the program will always show the latest animation sequence without any further operator action.

NOAA Gridding and Temperature Calibration

The innovative MegaNOAA program will take the whole pass of an orbiting satellite and store the complete data. Automatic gridding and a 'you are here' function help image-interpretation on cloudy winter days. Spectacular colour is built in for sunny summer days. Self-calibrating temperature readout enables the mouse pointer to show longitude, latitude and temperature simultaneously.

Equipment

Meteosat/Goes

❒ 1.0M dish antenna (UK only) ❒ Yagi antenna
❒ Preamplifier ❒ 20M microwave cable
❒ Meteosat/GOES receiver
❒ VGASAT IV capture card
❒ Capture card/receiver cable
❒ Dish feed (coffee tin type)

Polar/NOAA

❒ Crossed dipole antenna
❒ Quadrifilar Helix antenna (late 1991) ❒ Preamplifier
❒ 2 channel NOAA receiver ❒ PROscan receiver
❒ Capture card/receiver cable

Call or write for further information.

USA Education Dealer. Fisher Scientific, Educational Materials Division, 4901 W. LeMoyne Street, Chicago, IL 60651. Tel: 1-800-621-4769

USA Amateur Dealer. Spectrum International, P.O. Box 1084, Concord, Massachusetts 01742. Tel: 508 263 2145

TIMESTEP WEATHER SYSTEMS

Wickhambrook Newmarket CB8 8QA England Tel: (0440) 820040 Fax: (0440) 820281

The World of Weather

As well as complete systems, Timestep allow you to buy all the parts separately. The quickest and least painful approach is simply to buy a complete system. Take your time and take advantage of our RIG special prices (UK only), you will save some money ! The parts you will need assuming you are using the IBM type PC approach are :-

Meteosat

Meteosat is probably the best place to start. It sends images constantly. Remember you do not need a NOAA receiver if you use our Meteosat Receiver (designed to work only with a preamplifier).
This will free your NOAA system to look for the Soviet polar orbiters, something every satellite enthusiast should be doing !

Timestep products (world prices)	Britain	Europe	USA	RIG UK Members
1.0M dish antenna and feed horn	£164.95	£215.00	N/A	£139.95
Meteosat P-HEMT pre-amp (essential)	£184.00	£210.00	$350.00	£124.95
20M cable	£ 19.95	£21.00	$ 69.95	£ 16.95
Meteosat receiver	£199.00	£225.00	$399.00	£169.95
PCSAT III interface card	£199.00	£225.00	$299.00	Henry Neale
PROsat II card and software	£399.00	£425.00	$399.00	Henry Neale
PCSAT III connecting cable	£ 14.95	£ 19.95	$ 29.00	£ 9.95
Dish feed (coffee can type)	£ 49.95	£ 58.50	$ 99.00	£ 29.95

Superior Pager Resistant Receiver !

or your money back !
Now many RIG members have pager free reception on their new Timestep receivers. Why not join them ? The scanning receiver covers all known satellites including the complete Soviet series.

Crossed dipole antenna	£ 54.95	£ 65.00	$ 99.00	£ 39.95
NOAA pre-amplifier	£ 29.95	£ 34.50	$ 72.00	£ 24.95
50M cable	£ 39.95	£ 42.00	$139.95	£ 34.95
PROscan receiver	£299.00	£325.00	$560.00	£249.95
Track II, PC prediction	£ 29.95	£ 29.95	$49.95	£ 24.95

HRPT

6 channel complete receiver, pre-amp input, data output	£499.00
PC Data card and software including gridding and temperature calibration	£199.00

Primary Data

PDUS data card and software	£399.00	£425.00	N/A	£299.00
PDUS 2 channel receiver	£799.00	£825.00	N/A	£499.00

All prices include VAT at 17.5% and carriage in Britain, and Air carriage to other destinations.

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